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AVIATION & COSMONAUTICS

Teachers, Students Exhorted to Participate in Restructuring

91440063a Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 87 (Signed to press 31 Jul 87) pp 1-3

[Article by Col Gen Avn A. Goryainov, air force deputy commander-in- chief for military educational institutions: "In a Creative Union"]

[Text] The future of our military aviation is being born today. In the not-too-distant future, those who are presently assimilating the rudiments of military aviation occupations in lecture halls and laboratories and at airfields will shoulder the main load of the responsibility for the inviolability of the Soviet Union's air borders.

The party placed major emphasis on the issue of improving the entire system of education. This issue also pertains to military educational institutions of the air force, which train flying, engineering and technical personnel. Essentially all aspects of the organization of the military educational process require revolutionary restructuring. The entire depth and acuity of problems requiring efficient solution can of course be evaluated only in relation to a specific educational institution. No one from the outside can institute progressive innovations. Only the command, the political department, the communists and the Komsomol members are capable of creating real order in their own house.

And yet there are some general problems characteristic of practically all of the air force's military educational institutions, problems we need to think very seriously about. What is the first thing we must do in order to improve the training process?

I think that the way in which theoretical courses given in different departments are tied together must be revised to a significant extent. It is very important for the collective of every department to structure its work from the point of view of the military specialty which the young person will acquire as a result of participating in and assimilating the entire training program. This is easy to say, but it is something hard to put into practice, because as soon as we set the goal of interrelating different disciplines, it becomes necessary for instructors of all scientific profiles to have a deep acquaintance with military aviation. What do I mean?

Consider for example exercises in mathematics, in which cadets learn to apply what they learned in lectures. We would find that the problems they solve have nothing to do with aviation. Could it be that mathematics is too abstract a sphere of knowledge? All right, then let's sit in on a lesson in probability theory—a science with clear military applications. Here again we would hear all kinds of examples, except ones having anything to do with aviation. We would not see problems reflecting, as an example, meteorological situations, or problems amplifying on combat readiness, nor would we hear about "seasonal" fluctuations in the failures of aviation equipment or mistakes of flight crews, and so on. And yet, the future air specialist must be constantly immersed in those problems which are to become his way of life.

I must say frankly that a systemic, integrated approach would not take on its own. It can be achieved only by way of thoughtful joint work of associated and not-so-associated departments. Without a doubt it is easier and simpler to organize training on the basis of books written by respected university collectives. But is this really more effective? What we need in air force military educational institutions is a practical orientation to the training process; every discipline must have applied significance to the aviator's military specialty.

Practical exercises also require significant adjustments. This form of training is not intended to be simply the illustration of theoretical lecture material we still often encounter today. It must provide supplementary knowledge, it must arm the cadet and the student with skills and habits in the use of theory to solve those problems which await him beyond the threshold of the educational institution.

Take for example the practical exercise in aerodynamics and flight dynamics carried out in a flight school. The plan of such a lesson usually contains 10-12 questions encompassing the entire topic. The instructor checks how well the cadets have assimilated what they heard in the lecture. Only a few minutes are allocated to each question, and naturally the discussion marches on at double-time. In the final analysis the cadet leaves the lesson crammed with fragments of information that are forgotten on the spot.

It seems to me that the instructor should tackle not a mass of problems but just two or three, or even one, and expand on it completely. He should teach cadets how to perform the calculations, including how to use simplified formulas to efficiently arrive at approximations; while limiting himself to providing a detailed and clear procedure for solving a single problem, he should also demonstrate the critical factors, analyze the theory behind them, show what to do to avoid mistakes and demonstrate what must be done if mistakes could not be avoided. And self-study assignments should be tailored to the individual and they should cover the entire topic.

I can foresee that some people may treat the study subject plan as law. But laws of this sort are created by specific collectives, and no one frees the departments from creative enquiry and from responsibility for the result of studying a given discipline. As with procedures, the study subject plan is not dogma. It must be changed in accordance with the requirements of life. On the other hand this is an area that requires a certain amount of boldness, responsibility and scientific prediction.

One of the most acute and urgent problems of military pedagogics is that of forming the need for and habits of independent work in young aviators. Much has been said about this. But sad as it may be, many school graduates have developed a passive attitude toward their occupational development. Many feel that they must be led by the hand through their life and service. This is a belief they picked up in school. There are of course other examples where from their very first steps young officers begin drawing up their own program of occupational improvement and their own plan for their entire life, one which they follow successfully, and adjust depending on circumstances.

The possibility of allowing some fraction of cadets and students to study certain training courses and even subjects on the basis of a personal plan, without mandatory attendance of lectures, has long been under discussion from a theoretical standpoint. But are many cadets really able to work independently in our schools? To shape independent thinking in the young person means to teach him to acquire the necessary new knowledge himself, and to apply theory to practice. A cadet should never be excused from working on some practical problem, even the simplest, within the limits of his individual capabilities.

Course work should also develop independence. But once again this requires a diversity of subjects, an individual approach and the requirement that knowledge be qualitatively transformed into abilities. I think that a course subject should be formulated in such a way as to include independent work on some new subdivision of scientific information that had not been "covered" in correspondence with the program. This is laborious work, but it is the only way that the goal can be attained. Nonetheless, some departments have simplified the work of their students to the maximum. For practical purposes everything boils down to plugging in numbers or facts. There is simply no need to carefully test the results of such course work, which is why they are never seriously tested.

The activities of military scientific societies associated with school departments and the depth and orientation of military scientific work done by cadets and students also require significant changes. Life in the troops makes this necessary. It must be said that the demand for scientific research by collectives of air force units is constantly growing. An increasingly wider range of problems in troop combat training are being subjected to scientific analysis. Problems concerned with combat readiness, with tactics and use of equipment in combat, with repair and restoration, with training procedures and with organization of socialist competition no longer allow us to seek solutions approximately, empirically. There is enough here, one would think, to validate the acute need for developing research qualities in aviation specialists, their habits in organizing and conducting scientific and practical enquiry. Who but the military educational institutions should accept the responsibility for laying the foundation of the professional creativity of their graduates?

It cannot of course be said that the activities of military scientific societies are not producing positive results. They do exist. This year around 90 projects were submitted for competition by cadets and students from various air force military educational institutions. High assessments were given to the work of Cadet A. Pavlovskiy from the Kharkov Higher Military Aviation Radioelectronics School imeni Leninskiy Komsomol Ukrainy, and of a group of authors from the Kharkov Higher Military Aviation Engineering School—Lieutenant V. Ganiyev, Sergeant A. Kochetov, Junior Sergeant A. Averyanov and Cadet V. Skidan. The Military Air Academy imeni Yu. A. Gagarin, the Military Air Engineering Academy imeni N. Ye. Zhukovskiy, the Riga Higher Military Aviation Engineering School imeni Yakov Alksnis and the Tambov Higher Military Aviation Engineering School imeni F. E. Dzerzhinskiy are distinguished by good organization of military scientific activity.

Success is always pleasant. But many problems still exist. Most acute among them is the method by which the collectives of the military- scientific societies are formed. Societies associated with school departments usually suffer instability. People join the military- scientific society of a specific department only when they begin studying within it. And frequently when they complete their studies and pass their examinations, they leave the society, and go on to a new department. And once again just temporarily. This practice is doubtlessly not the best way of learning about science.

It would probably be more useful for the cadet or student to remain a member of a single military-scientific society throughout his entire period of training in the military educational institution. This would produce an additional impact in the form of experience in independent work, naturally under the supervision of instructors. But this is only the organizational side of the problem. It is no less important to raise the level itself of scientific work. It would seem suitable to conduct integrated research: A group of students could receive personal assignments which in their sum total would embrace one whole problem that could be researched under the supervision of a senior comrade. The research that is carried out should become the possession of the entire collective of cadets, students and instructors.

A decisive turn toward development of capable specialists and, possibly, future scientific personnel is obviously required in the activity of military-scientific societies. But as experience shows, this idea has not yet caught on everywhere. There could be no other explanation for the paradox where consistently mediocre students are literally forced to become researchers. The motivation given

to the student is astounding as well: If he carries out a project, he is granted an extra point in the examination—that is, he is assured a passing grade.

The military pedagogical process should be oriented as a whole not simply on developing the intellectual capabilities of the personality. It must also be adjusted in accordance with the interests of the future profession. Specifically, the endowments of the cadet and the student must be polished: That which nature and secondary school had given him, and that which the individual had come to the military aviation school with must be tuned.

Educational work in military schools requires even greater labor, greater boldness and novelty, and even greater responsibility today. I am certain that no one would doubt that by solving the education problem we can surmount all of the other problems in many ways. We use concepts such as communist ideology, conviction, devotion and patriotism frequently and lightly, we ascribe these lofty qualities to a person simply because he is one of us, because he was born and raised in our country. And yet, each of these concepts represents not some nebulous saintly quality but an entirely specific relationship of the individual to the things that official duty lay upon his shoulders. To say that a person is principled, convinced, devoted and a patriot simply because he makes frequent use of these terms is incorrect, improper and unjust.

Let us look at some examples from life. Consider a cadet who makes it from one semester to the next and from one subject to the next with mediocre grades. Are there any grounds for assuming that he possesses high moral qualities, especially in the social sense? Of course, real life is richer than any hypothetical example. A satisfactory grade would be justified, I am sure, if the cadet has applied colossal efforts to make up the things he missed and to attain the corresponding level of training, and if he is still dissatisfied with himself even so. This is an indication that he has begun his ascent to higher results, and consequently to higher grades. I think that such cadets have to be supported, they must be provided help in acquiring new knowledge. Experience shows that later on such cadets become reasonably good, competent specialists.

On the other hand those who receive mediocre grades because they are lazy, because they hold back, and those who work on all study assignments as if they were a burdensome obligation deserve an entirely different assessment. Students of this kind must be dealt with most strictly, because by their unconscientiousness during their school years they deprive themselves of what is most important—their development. We must be merciless and uncompromising toward such students. A Soviet- educated young person would not succumb to circumstances and conditions barring his way to fulfilling his responsibilities.

Special attention should be turned to those who in their second or third year come to the strange conclusion that they would not be dropped after so much money had already been spent on them. This strategy generates the "tactics of attrition." A young, healthy lad is counseled by his instructor on five or six occasions, but he still earns the same mediocre grades. And as a rule he gets his way in the end. All of this needs to be brought into correspondence with the existing principles of organizing the training process.

Most of our educational institutions have a glorious history. Many school and academy graduates have inscribed their deeds and names in the heroic chronicle of the air force and the USSR Armed Forces in gold letters. This is why we are fully entitled to capitalize actively on the unfading traditions of senior generations. But if we concern ourselves with traditions only in museums of combat glory and on holidays, we would be limiting ourselves to nothing but empty formalities. Traditions come into being through selfless labor, through the highest responsibility for one's duty. Consequently what they require from today's generation is not fanfare and applause, but excellent assimilation of the chosen profession in military aviation. This approach would be a continuation of those traditions, while any other would be a mockery of them.

Morality, ideology and conviction can be measured today by clear and precise yardsticks—the individual's attitude toward his work and the results he achieves, and not assurances and promises without any solid basis. All of this pertains equally to both the students and the teachers. The participants of the education process cannot exist in two separate camps. Only education that is based on a creative union of the student and the teacher can be reasonable and effective. This is not a theoretical principle: It is the essence and substance of the life of our educational institutions.

If we wish to organize things properly in the schools and academies, it would be useful to ask this question: Who is the main actor in the military educational institution? At first glance the answer does not seem difficult: Since the purpose of an educational institution is to teach, then the main actor within the institution would be the teacher. But it seems to me that this answer conceals one of the greatest misconceptions of modern pedagogics. The fact is that the main actor is organically associated with the end result of all of the activities of the military educational institution. Hence it is clear that the main actor would be the cadet or student. But when we say that the student is most important, we do not imply that he is superior in some way. What we mean is that the goal which he seeks, the general orientation of his work, the purposefulness of his training, and concern for those who study, for those who are to accept responsibility for work in combat collectives beyond the educational institution's threshold are what is most important.

At the same time, the instructor staff has no grounds for resenting such a "reduction in rank," because the teacher is still the main creator of the future specialist. I believe that the optimum distribution of roles in a modern military educational institution would take the form of a union of like-minded individuals, a union in which the interests of this specialist and the interests of the society are held supreme, and in which all effort is based on wise, fatherly guidance of the development of the future specialist.

"Study, study and study some more...." There is one aspect I would like to consider in this commandment of Lenin's. Everyone must study constantly, continually, including students and teachers. They must study the specific things which the individual does now, and the things for which he is responsible today and in the future. In this unending study we must not only pursue scientific interests but also develop proper relationships with the study group, with the commanders of training detachments and with every cadet and student. And they can be of all types—obedient and disobedient, quick-thinking and slow, willful and not so willful, active seekers of new ideas and passive students. To be an individual is one of the human rights, if I may be permitted to use that term. But the ability to work with each individual is the direct official duty of the person given the great mission of teaching.

The most important task of military educational institutions today is to produce not simply military professionals but active participants of the revolutionary transformations that our society is experiencing today, passionate and competent champions of restructuring. In this respect it would not make sense to divide responsibility between departments, and I do not believe that this task should be assigned only to instructors in the social disciplines. This is a common task of the entire training institution: It is a task of the command, the political department and the party and social organizations. But the instructor staff bears special responsibility, because its influence upon the cadet and the student is constant, consistent and systematic in the course of the training process, if of course the latter embodies the appropriate goals and ideas.

While the task of developing officers who several years hence will carry on revolutionary changes in military affairs must remain an integrated task, every department and every scientific pedagogical collective must see, understand and feel the uniqueness of its participation in the overall process of educating the soldiers. From this aspect the task of social science departments is to make students deeply aware of the sociopolitical essence of the necessity and naturalness of revolutionary changes, an awareness of the natural maturation of life's contradictions, which are the constant motive force of progress in socialist society. But the difficulty in carrying out this part of the overall task today lies in the fact that social science departments cannot limit themselves to simple transmission of batches of knowledge. It is their duty not to simply arm the intelligence but to create a need in the individual to maximally realize his personal capabilities in serving the motherland. What is qualitatively unique about the new approach is that it demands inspired knowledge, and not just doses of scientific-sounding information.

On their part, the special departments are obligated to provide the future officer with a professional background which would equip him with perfected building blocks that he could use to make a real contribution to the restructuring effort. For revolutionary work to be possible, both theoretical knowledge and practical skills must be charged with a revolutionary element—that is, profound scientific knowledge must be combined with a clear practical orientation and with an active personal desire for self-realization in the interests of the air force. Figuratively speaking, the task of the social science departments is to skillfully tune the strings of the soul to a modern scale, while the special departments must teach revolutionarily modern, virtuoso performance with these strings.

Our times are fabulous precisely because they are so complex. No difficulties, no volume of tasks and problems can evoke consternation in those who are serving the fatherland, who are creating the future of the country's defense, and who are shaping those who will transform this future into a reality. And those who measure their participation in both today's and future activities by precise numbers of working hours, by a dosed load, are the rejects of today. Who they are is immaterial— be they cadets in their first year or professors with a distinguished past.

11004

Alert Forces Deal With Airspace Intrusions

91440063b Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 87 (Signed to press 31 Jul 87) pp 5-6

[Article: "If an Alien Airplane Appears in the Sky"]

[Text] The social nature of the USSR Armed Forces is reflected in all aspects of the army's and navy's life. The fact that besides performing military functions our soldiers often perform purely peaceful tasks—they help build things, they work on the farms in harvest season, and they assist the public in natural disasters—persuasively attests to the defensive orientation of not only Soviet military doctrine but also the entire way of life and activity of the troops.

But there is a special task which remains job number one for our soldiers no matter what the circumstances: to maintain constant combat readiness for an annihilatory retaliation in the event that anyone dares to test the strength of our socialist fatherland's boundaries by force of arms.

And although constant combat readiness is not just a duty but also the style of the life of every military collective, every serviceman, the interests of the country's security also require special measures that would ensure the inviolability of the motherland's borders. It is precisely with this goal that certain combat subunits are constantly kept ready to enter into combat immediately, to perform a task of state importance at any time. These are the subunits that serve alert duty. What are the principal features of alert duty as a means of ensuring the country's security?

Colonel V. Kashirov, Air Force Chief of Fighter Aviation Combat Training, Honored Military Pilot

Alert duty is an extremely specific function with many unique features, and it would hardly be possible to list them all. Let me name the most important ones in this responsible and complex activity.

First of all, alert duty is the performance of a combat mission in peacetime. Just the unusual combination of the words "combat" and "peace" alone injects considerable complexity. Things are routine, quiet, ordinary. For all. Except for those serving alert duty. These people may have to go into combat at any moment. And they must instantaneously become not just pilots but air warriors in the full sense of the term. They must find the inner strength to instantly discard all thoughts of peace and to employ with maximum effectiveness their combat proficiency, which took years to develop. And even with such proficiency, it is not all that simple to squeeze the trigger and annihilate an airborne target.

Out of the diversity of unique features, I would also like to emphasize the fact that alert duty means a preparedness to engage an unknown enemy, or such engagement itself. Professional military pilots train for combat and attentively study their probable adversary for years and years. Given all of its complexity, military aviation does adhere to certain laws, principles and predictions.

But alert duty proceeds in an entirely different situation. Let me be frank: As far as is known to us, practically all airspace violations by aircraft of imperialist countries have always been provocative acts, ones having deeply concealed political goals as a rule. Such provocations are prepared for meticulously, and they are calculated, practiced and rehearsed down to the finest details. Sometimes "specialists" take months and even years to prepare for such actions (military-political operations essentially). The most sophisticated tactics are put in motion: There is a wide range of choice of different kinds of aircraft—"passenger," "sports" and others, and different kinds of crews—"lost," "in distress," "investigating the upper layers of the atmosphere" and so on.

In just seconds, personnel of alert forces must answer hundreds of questions in order to reveal the cunning intentions of the intruder. What is very important here is that when a pilot takes off in a state of alert duty, he may be called on to utilize all of his firepower and annihilate the intruder. And the intruder is not just an airplane or a helicopter: It is also an individual who has been enticed into adventure possibly by deceit but most often by money. Alas, the real provocateurs, the true enemies of peace remain in the shadows, safe from just retaliation.

Alert duty is complex precisely in that it does not tolerate compromise.

I feel it necessary to note that the military collectives headed by officers S. Drozdov, V. Chukichev, K. Kozlov and S. Chizhikov are serving alert duty with exceptional dependability, without a single failure.

Air force soldiers may look into the eyes of our country's laborers boldly and with clear conscience, because they are prepared to fight the most insidious enemy. This has been demonstrated on several occasions.

Colonel I. Grishalevich, Air Regiment Commander, Military Pilot 1st Class

No matter how busy I am with administrative concerns, I always find time to organize alert duty. There can be no other way: We are responsible for the inviolability of the country's air borders within the sector entrusted to us. And there is one aspect of alert duty that we always have to discuss frankly—the uncompromising nature of the laws of this service, and the inevitability of foiling the actions of intruders.

No circumstances can remove or diminish the responsibility of a pilot, a technician or a tactical control officer for fulfillment of a combat mission. There can be but one relationship to it—it must be carried out.

It is of course no secret that the reactionary war machine of the imperialist blocs is preparing for war. Nor is it a secret that before aggression begins, a number of measures are usually implemented, on the basis of which many things can be foretold. But given today's offensive weapons, the advantages of a surprise attack are so great that we cannot exclude a situation where the aggressor would trade preliminary mobilization measures that would reveal his criminal intent for the advantages of a surprise attack.

This is why there can be no compromise in the actions of alert forces, no doubts, no vacillations. If an intruder appears, measures appropriate to such a situation must be taken. Nothing is too much when we are talking about peace for our motherland.

In fact, airspace violations always assume the nature of refined adventures. Sometimes it happens in this way: Capitalizing on the possibilities of modern weather forecasting, on learning that adverse weather would exist over such-and-such a region of the USSR at a certain hour, some "military officials" organize provocative flights near our borders, counting on the fact that we would not take off. Occasionally we are required to take off several times to chase "curious" aircraft farther away from the USSR's legally established borders, and land in very complex conditions. And it is only after they are persuaded that the nerves of our fighter pilots are strong, and that their proficiency does not leave anything to be desired, that they go back where they came from.

I must admit that I feel shame for such "soldiers." This is essentially not simple adventurism, but cheap hooliganism. Of course, this does not decrease the responsibility for unconditional fulfillment of the combat mission. Whether it is an adventurer, or a provocateur, or a hooligan that violates the inviolability of our borders is a secondary question. Whatever the case, this is the enemy, and therefore he deserves but one thing—to be cut off.

I always have good thoughts about pilots A. Tikhomirov, I. Kazakov, M. Gizatullin and Ye. Yatsuk and technicians V. Tarasov, S. Giryavk, V. Tarasenko and M. Alekseychik, who on several occasions have accepted the responsibility for keeping the sky peaceful, for keeping the enemy out of it, and decisively and quickly restored order in the USSR's airspace.

Very serious preparations precede initiation of alert duty. This is not to mention the fact that highly skilled military specialists are assigned to this duty. But that is not all. We take the personnel through an entire complex of trials: tactical flying exercises, training exercises in airplane cockpits, specific-purpose training sorties, and coordination of all services supporting alert duty. And this is not the complete list of everything a person must undergo before going on duty. But what is most important is that the commander must be certain that the moral and psychological qualities of the personnel would permit them to carry out their combat mission.

Major V. Korneyev, Air Squadron Deputy Commander for Political Affairs, Military Pilot 1st Class

A sign hanging above the entrance to the room where pilots, technicians and mechanics carry on alert duty reads: "Airmen! Be prepared for heroism in behalf of the fatherland!" It might seem that these are nothing more than exalted words. Exalted and solemn they may in fact be, but for us on alert duty they are an expression of that necessary working state which an air warrior must achieve before he is entitled to appear for duty.

Life has confirmed again and again that air force aviators act not only professionally but also heroically whenever our airspace is violated. There are examples of self-sacrifice when the pilot has found himself with no other means of stopping a intruder at his disposal. And not just in the distant past.

Several years ago a foreign airplane invaded the USSR's airspace along our southern borders. Squadron deputy commander for political affairs, military pilot 1st class, Officer V. Kulyapin, who was on alert duty at this time, was ordered to cut off the intruder. He fulfilled his mission honorably. The pilot was awarded the Order of the Red Banner for proficiency, courage and decisiveness displayed in the performance of this combat assignment.

Captain G. Yeliseyev, a squadron deputy commander and a military pilot 1st class, also committed a clear act of heroism when he took off to intercept a real airborne target while on alert duty. The situation evolved in such a way that Yeliseyev was compelled to ram the foreign intruding airplane at the last minute. The air warrior did not flinch, and at the cost of his own life he blocked the enemy's path into peaceful Soviet skies. Gennadiy Nikolayevich Yeliseyev was awarded the Hero of the Soviet Union title posthumously.

All officers of our subunit that serve alert duty have proven themselves to be politically alert and ready to engage the enemy in dangerous combat. But pilots A. Nikodimov and S. Putyatin and technicians I. Pogodin and I. Smirnov work especially efficiently.

The instantaneous transition from peaceful life to combat requires certain spiritual strengths—unbending communist conviction, total devotion to the motherland, boundless courage. Where do they come from? This is a very hard transition to make. After all, everything in your life was calm and routine just a few minutes ago, and suddenly you are ordered to take off. And immediately you begin living the laws of aerial combat.

Years of intensive professional training, the entire system of education and the way of life of our aviators are all directed at shaping not only the professional soldier but also a citizen officer of the highest caliber.

Nonetheless the main motive of heroism has its roots deep in the personality of the Soviet soldier—love for the socialist fatherland and the people. To the military serviceman, many social concepts are filled with special content that intimately interweave the personality and the society. An officer's motherland is the place where he was born, the land where he learned to fly, the region where he serves, and every corner of Soviet land, even the most remote, where he had once served himself or where he will serve in the future, where friends are standing alert duty in the same minute.

The valor and courage of the military person are not exceptional qualities but a necessary component of the profession, without which an air warrior cannot exist. An aviator's honor is stronger than any danger that may be encountered in flight, and all the more so during a sortie as part of the alert forces.

It is from all of this that the readiness for heroism, which while being an exalted civilian quality is also simultaneously a constant state of the spirit of a Soviet aviator, is formed. This is why there is no doubt that alert duty is being served by people ready for combat. Fighter pilots serving alert duty follow their own law of life, which in essential terms is the readiness to meet the unforeseen—that is, a readiness to commit acts of heroism.

11004

Excellent Exercise Results Based on Good Preparation

91440063c Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 87 (Signed to press 31 Jul 87) p 7

[Article by Maj B. Poluektov, squadron deputy commander for political affairs, military navigator 2d class: "Relying on Initiative"]

[Text] The bright disk of the setting sun lingered over the sawtooth pattern of the treetops. Parked airplanes were clearly silhouetted by its rays. Flying was finished.

It was a hard day for aviators in Captain A. Gomozov's flight. During a tactical flying exercise they conducted visual reconnaissance of simulated enemy tactical nuclear weapons in their designated area. The exercise had become a serious test of their occupational proficiency: Not all of the pilots in the flight had experience in flying such missions. Officers Yu. Misailidi and S. Dyakov were the best trained.

These pilots joined the flight after graduating from school. They assimilated piloting techniques and combat use of their aircraft on schedule. But the professional development of the officers did not always proceed smoothly: Misailidi found air reconnaissance more difficult, while making a "clean" landing under minimum weather conditions at night was not something that came to Dyakov right away.

Captain Gomozov taught many pilots to fly during his career. And he helped Dyakov get over his difficult hurdle faster. After flying with him a few times he convinced himself that the cause of his problems lay in his inability to distribute attention while on the landing course. The flight commander began working purposefully with the pilot. He scheduled more time for him for training in the airplane cockpit and in the trainer, and he constantly monitored his actions on the ground and in the air. In the end, Dyakov developed firm habits in making his landing approach, and he began performing this flight element without mistakes.

The reader may ask, what is remarkable about this? A commander teaches his subordinate, and that's all. True, he does teach, but the principle Captain Gomozov follows is that he must not simply help to correct mistakes and to teach a pilot to act competently, but he must also hone habits to perfection. He spares not effort in this work, and he does not coddle his subordinates. In this way, the flight commander tunes the young aviators for serious work and for attaining high summits in occupational training.

It is evident to all of us that the volume of knowledge and habits which pilots must master today is constantly growing while the training time and the class preparation time are not increasing. How do we resolve this contradiction? I think that the solution lies in improving the teaching proficiency of flight commanders, taking a scientific approach to lesson organization, improving and making fuller use of the training material base and, finally, working on study problems integrally within any one lesson.

This was an item of discussion during one of the meetings of the party buro. The procedure Communist Gomozov follows in his work with young pilots was used as the example. I feel that there are many useful things in the procedure he employs. Here is the way he organized lessons conducted prior to a tactical flying exercise.

The aviators approached their task as if it were a combat mission—with full responsibility. During the lessons they discussed the possible ways in which to complete their task, and carried out the necessary calculations. Captain Gomozov provided substantial explanations as he drew the antimissile maneuvers on the blackboard. But he soon noticed that some of the students were losing interest in the lesson, apparently feeling that the commander was going over things that everyone already knew. What was behind this attitude? The officer was able to correctly perceive that excessive self-confidence was chiefly to blame. With the consent of the squadron commander, during a study break Gomozov invited the commander of another flight to his classroom. During a recent tactical flying exercise the subordinates of that commander received a low score, and Gomozov asked the flight commander to explain the causes of their failure to his own students.

"We clearly underestimated the possibilities of the 'enemy's' air defenses and overstated our own strengths. In the final analysis we were unable to complete our entire assignment," the officer said.

Gomozov correctly surmised that the failure of his comrades had to serve as a lesson to the pilots and navigators. We know, after all, that we learn from our mistakes as well.

The thorough briefing by the commander of the neighboring flight, which was reinforced with facts and figures, was useful to Gomozov's subordinates. They became aware of the role of meticulous preparation for actions in a tactical flying exercise, and they came to understand what the slightest mistake could lead to.

His subordinates became engrossed in creative enquiry; they were caught up in a desire to find the most optimum method of carrying out their complex task. In the meantime Gomozov kept introducing new scenario inputs, constantly complicating the situation and forcing the pilots and navigators to think creatively and seek nonstandard solutions.

"What do you think, where would it be most advantageous for the 'enemy' to locate his rocket launcher?" he asked Lieutenant Yu. Vesov.

After thinking a minute, the latter pointed to a forest on the map:

"Right here."

"Can you be more specific?"

A long period of silence followed.

"Lieutenant Fokin, help your comrade," the flight commander asked one of his other subordinates.

The aviators bent over the map. They "probed" each quadrant with a pencil. They took many circumstances into account—the tactical situation, the characteristics of the launcher, the possible ways in which it may be used in combat, the topography, presence of roads and others.

"Right here, at the forest edge!" Vesov finally answered confidently. "This place completely satisfies all of the requirements."

The lessons went on. Captain Gomozov once again recalled the typical signs by which to identify their objective, and he pinpointed the approach to the target area, the ways of surmounting "enemy" air defenses, the reconnaissance procedures and the actions to be taken on the return journey. Under the guidance of the experienced teacher the young aviators reinforced their habits of conducting air reconnaissance and in other forms of combat use of their aircraft when flying in pairs or as a flight. They all solved the problems together.

All of the crews of the flight underwent their examination during the tactical flying exercise. The scouts performed their antimissile maneuver efficiently and smoothly during their target approach. Maintaining a tight combat formation, the airplanes flew over the search area at minimum altitude. Symbols denoting "enemy" launchers detected by the scouts appeared on the map one after another. And soon the coordinates were transmitted to the command post. The flight confirmed its right to be called one of the best in the squadron.

11004

Fine Line Drawn Between Justified and Unjustified Risk

91440063d Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 87 (Signed to press 31 Jul 87) pp 10- 11

[Article by Maj K. Burnyy, military pilot 1st class: "Is the Risk Justified? (A Discussion of the Article 'The Sky Does Not Pardon Mistakes')"]

[Text] Having flown his helicopter to the training ground and having visually found his target, pilot Senior Lieutenant L. Dotsenko began his attack, straining to keep the tank mock-up at the center of the cross-hairs. Unfortunately he got carried away, and he launched his missile from less than minimum range. Twice the flight leader at the training ground ordered the pilot not to fire, but the latter acted as if he could not hear his instructions.

While this incident happened long ago, it is instructive. It was revealed in a discussion with Dotsenko that he wanted to test his limits. The "experiment" ended rather sadly for him—the pilot was strictly punished.

This case came to mind in connection with the discussion of the article written by squadron commander Lieutenant Colonel V. Antyufeyev. The author is right when he says that indifference, complacency and conceit cannot be tolerated when it comes to ensuring flight safety, since they retard growth of combat proficiency, cause violations of flying laws and evoke other undesirable consequences.

Risk is a noble thing. These words are often heard from young air warriors. But interpreting them one-sidedly, they reason in the following manner: A pilot's occupation is such that danger is unavoidable in it. This is a convenient explanation, but it is not entirely accurate. It is true that every aviator faces danger in one way or another. But the real necessity of risk must be taken into account in this case, and everything must be done to widen the limits of what is possible. In other words every risk must be deeply conscious, and it must be dictated by expedient necessity. Only in this case does it actually acquire the nature of a noble act, one requiring the individual to display maximum strength and energy, enormous volitional effort, and sometimes even the highest price—life itself. A convincing confirmation of this is the combat work of Soviet pilots during the war, especially at times when ramming the enemy was the only way to achieve victory in aerial combat.

As far as Senior Lieutenant Dotsenko was concerned, he did not have the right to take the risk. After all, the pilot was endangering both his own life and the life of the crewmembers. But the main question is why had he taken the risk, for what purpose? What was the necessity of such an unreasonable risk? The aircraft he was piloting had been in the inventory for a long time, and it had rightfully earned the popularity and love of flying personnel. And there was absolutely no reason for testing its combat characteristics and tactical capabilities one more time.

What about testing himself? That cannot be an answer, because pilots are given the opportunity for doing so often enough. Like Valeriy Chkalov, many of us, if not all, have had to attack "our own bridge" in order to prove ourselves to ourselves. But is such a direct method always justified? I recall a case from my own flying experience.

Having decided to utilize a previously untested maneuver in aerial training combat, the crew commander and I sat down to make the necessary calculations. We felt that we had foreseen everything, but when it came time to perform the maneuver, we found that we created an extremely complex situation for the fighter attacking us, and we ourselves came very close to violating the requirements of flight safety. Both of us were strictly punished for creating the conditions of a near-accident. Analyzing the incident, the squadron commander blamed us for ignorance of pilot instructions. And yet when the whole thing started we felt we were quite the daredevils. But the critique revealed that we had substituted boldness by rashness.

Risks must also be taken sometimes in routine training. But even then, flight safety cannot be forgotten. At first glance, risk and safety appear to be incompatible, mutually exclusive concepts. But we would have to admit that risk is a natural continuation of initiative, which itself requires adoption of a decision that is nonstandard but which falls within the framework of safety. But what happens to initiative and boldness when risk-taking becomes unavoidable? After all, the enemy is always trying to conceal his intent, while the pilot is compelled to enter into combat with him with incomplete information. This is apparently what restrains the combat aggressiveness of certain young aviators in a complex situation, in which they display excessive caution, fearing that they might make a mistake.

Flight regulations are of course rigid. And any self-willed deviation from the established requirements is a violation which can sometimes lead to accidents. However, analysis of the causes of flying accidents shows that they often occur not due to initiative as such, but due to the aviator's inability to fully utilize the possibilities of the aviation equipment or, still worse, due to personal lack of discipline.

The opinion of experienced pilots on violations of flight regulations is unanimous: They have nothing in common with aggressiveness in combat. But it is not all that easy to see the dividing line between these concepts. Experience shows that initiative is good as long as it does not contradict flight safety regulations. Neglect of the latter is validly evaluated as a lack of discipline.

This is precisely the conclusion that was reached by squadron commander Major V. Alekseyev after analyzing the actions of Senior Lieutenant S. Kartushin, who exceeded the prescribed angle of attack in the course of a flying assignment. Although the exercise had been completed adequately on the whole, the pilot was given a lower grade.

Pilots, especially young ones, sometimes say that initiative becomes easier in real combat: Once you see the enemy, they think, you will act in the way you know how, in the way you can, without looking up instructions in manuals. Talking on this subject with Lieutenant Colonel V. Domrachev, a cavalier of the Order of the Red Star and a top- class military pilot who had the fortune of fulfilling his international duty in Afghanistan, I once again persuaded myself as to the erroneousness of this opinion. Domrachev refuted it completely. Prescriptions binding upon air warriors in peacetime retain their significance in a combat situation. Pilots of the war years say the same thing in their memoirs. Bravery for show, which has nothing in common with initiative, and unjustified risk led to disastrous consequences in those times as well.

Lieutenant Colonel Domrachev, who had to charge dushman bristling with fire on more than one occasion, told me:

"Only well-trained and disciplined pilots who do not forget about flight safety can fulfill an assignment in a combat situation."

When a situation becomes complex, deviation from the requirements of the documents that regulate flying sometimes becomes necessary. But this is an extreme measure, brought on by the desire to annihilate the enemy at all costs. Pilots of the war years understood this, and Lieutenant Colonel Domrachev also knew how necessary it was to observe flight safety measures when, for example, he had to deliver an airborne assault force to a "hot spot" quickly or provide fire support to Afghan soldiers engaging dushman in combat. On many occasions he could reach the landing area covertly only by flying to it at an altitude not sanctioned by the appropriate documents.

Basing himself on his deep knowledge of the equipment and his outstanding flight training, Valeriy Gennadevich took risks with regard for the specific situation. Acting at the boundary between what must be done and what is impossible to do, his crew successfully completed its

flight assignments. The experience of this officer confirms that risk may be justified only in the case where it is expedient, and if there is no other way to perform one's military duty or save human life. It is an entirely different thing when someone takes risks only because he had left something out in his work and has now decided to catch up, or all the more so due to a desire to show off, to achieve a false sense of self-confirmation.

The right to take a justified risk is granted only to those pilots who possess good knowledge and experience that would exclude any unforeseen dangers, and to those aviation commanders who are confident in their subordinates and who are capable of displaying not only tactical proficiency but also the courage of making a decision in modern combat. Here is an example.

A certain regiment was coming to the end of its tactical flying exercise when several traces from airborne targets maintaining a course toward an objective being defended by the regiment appeared on the radar screen. Lieutenant Colonel G. Torbov decided to launch Lieutenant A. Khyrkhyryan to intercept the target. Some of the officers present at the command post shrugged their shoulders in disbelief: Could he not have selected a pilot with a little more experience? Did the commander not make a mistake? Everyone waited impatiently to see how things would turn out.

Energetically responding to the commands of the flight control officer, Khyrkhyryan competently piloted his fighter. He flew right to his prescribed area and "destroyed" the target with well-aimed fire. The pilot honorably fulfilled his assignment. The boldness of the commander, who rested his decision on strict calculation, on a wise assessment of the situation and on faith in his subordinate, became an important factor of victory in a duel even with superior "enemy" forces, and an instructive example.

To us military people, whose lives are devoted to protecting the peace, circumstances may evolve at any moment in such a way that we would need to be the first to exercise our right to take a risk. A military pilot must be bold, strong, well trained and ready to repel the enemy at any moment.

11004

Pilot Dies a Hero in Afghanistan

91440063e Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 87 (Signed to press 31 Jul 87) pp 12-14

[Article by Col Ye. Besschetnov: "Until His Last Breath"; first paragraph is AVIATSIYA I KOSMONAVTIKA introduction]

[Text] Senior Lieutenant Konstantin Pavlyukov—a young Soviet pilot who was shot down from the Afghan sky after take-off—displayed exceptional bravery and self-control in battle with surrounding dushman, and he fought to his last breath, essentially annihilating the entire band. Pavlyukov lived but 23 years. His heroism will always remain in the memory of the Soviet people and air force personnel.

We were at the Afghan airfield from which he used to take off. Snowcapped peaks towered all around. We made our way to the parking pad. We stopped beside an airplane painted with a green camouflage pattern.

"It was aboard an aircraft of this sort that Konstantin took off on his assignment on that day," squadron commander Lieutenant Colonel G. Strepetov explained as his eyes surveyed the craft. "As you know, the government of Afghanistan declared a course toward national pacification at the beginning of the year. The Afghan army halted its combat activities as of 15 January. But the forces of counterrevolution and their transoceanic protectors resisted the positive process right from the start. Senior Lieutenant Pavlyukov was one of the first sacrifices to their dirty intrigues."

In the evening of 21 January 1987, the sixth day of national pacification in Afghanistan, a pair of aircraft consisting of leader Senior Lieutenant A. Pochkin and follower Senior Lieutenant K. Pavlyukov taxied to the end of the runway. The take-off of an Aeroflot airplane carrying passengers had to be covered from the air. After take-off, the leader turned left and began a steep climb. Pavlyukov stayed right on his tail.

"As I was watching," squadron political worker Major A. Rybakov continued his story, "after making the circle, while approaching abeam of the runway, over there," he pointed in the direction of a faraway kishlak situated in the foothills, "a white puff of smoke typical of an explosion of an antiaircraft missile appeared at the back of Pavlyukov's airplane. A second and a half or two later there was another explosion, a larger one, with black smoke. It was as if a jolt of electricity had run through my body: He's hit! And sure enough, the craft rolled over and dove steeply toward the ground."

The squadron commander and his deputy for political affairs immediately rushed to their warplanes and took off on the spot. In 7 minutes they were already over the site. Senior Lieutenant Pochkin was circling in the area also. The aviators discovered the burning airplane right away, but they were unable to find either the parachute canopy or the orange smoke of a signal flare, no matter how hard they tried. Soon a pair of Mi-8's escorted by a flight of helicopter gunships arrived. But the search by the helicopter crews was not graced with success. They did detect a stably working radio beacon between some huts in the kishlak, but it was quite likely that it was put there specially by the dushman as a trap. In fact, when Captain Yu. Bortnik, the leader of the Mi-8 pair, dropped to minimum altitude and approached it, heavy

machineguns and infantry weapons opened fire on the helicopter from the ground. The craft was damaged. Bortnik had to return to the airfield.

His follower, Captain V. Solyanov, took over the search. But not long after, he attracted gunfire as he approached the beacon. And it was already getting dark. Hard as it was, the tactical control officer had to call the crews back to the airfield. Hastily alerted airborne troops were taken to the crash site.

But what happened with Senior Lieutenant K. Pavlyukov? Some episodes of the Soviet pilot's heroism were reconstructed later on with the help of local residents and Afghan state security police.

After ejecting, Konstantin was wounded by dushman fire while still descending beneath the parachute canopy. He was wounded in the shoulder, the legs and abdomen. It was not a routine landing. As if deliberately, the parachute was caught by a branch of a tall tree, the canopy stretched out and collapsed, and the pilot found himself suspended in his harness above the ground. Evidently he was unable to use his radio set and signal flare because of his wounds. All he managed to do was pull out the magazines for his assault rifle and make an effort to free himself from the suspension system. This he was able to do. He fell to the ground, crawled to a roadside ditch and prepared to defend himself. Besides the assault rifle and five magazines, he had with him a loaded pistol and another two grenades, which he always took along on his missions. He was well armed. But how long would he be able to hold on if loss of blood noticeably sapped his strength? At least he did not doubt for an instant that his comrades-in-arms would look for him.

Flushed with their success, the dushman approached him brazenly, almost in plain view. Pavlyukov fired at them point blank. He hit one, and then another. The rest dropped to the ground. Then the band began firing on him from different sides. Pavlyukov stayed alert: Wherever fire flashes appeared, he immediately directed return fire.

The pilot had been fighting his unequal battle for half an hour. He could feel he was growing weaker from loss of blood, but he continued to defend himself courageously. Missile carriers and helicopters searching for him were already circling overhead and slightly to the side. It was a pity that he could not signal them. But perhaps his comrades-in-arms would see the flashes of the gunfire.

Pavlyukov had no intention of surrendering. He emptied all five magazines of his assault rifle. He fired all of his pistol cartridges as well. And his strength was ebbing.

When Konstantin stopped returning fire, the dushman possibly decided that it was time to try to take him alive. In the dim twilight he could see a few men approaching him, first timidly and cautiously, and then more and more brazenly. He counted eight dushman. He waited motionlessly until they were 5 or 6 meters away, when he lobbed a grenade from the ditch. There was an explosion followed by groans and cries. Killed outright, two of the bandits crumpled to the ground, while the rest, writhing in pain, quickly crawled away. And once again Pavlyukov was subjected to gunfire from all sides.

Konstantin knew that he had little time left to live. He decided to take as many of the enemy as he could with him. He gathered up all of his courage and will, and prepared himself for the final thrust. He had saved the second and last grenade for himself. And for the dushman as well. He pressed it against his right cheek, near his temple, and he lay there motionlessly. He clenched his teeth against the pain.

The leader of the band decided to personally take part in the Soviet pilot's capture. He gathered up his surviving accomplices and began approaching Pavlyukov with caution.

Konstantin was already at the border between life and death when he heard voices nearby. Someone bent over him in the darkness, as if wishing to make sure that he was dead. In that second Pavlyukov used the last of his strength to pull the pin out with his teeth. The explosion ended the pilot's short life and showered the bandits with shrapnel. By this time Konstantin was not to know that the dushman crowding around him were seriously wounded or were killed immediately, including the band leader.

This high courage and self-sacrifice were witnessed by local inhabitants who had been watching the duel closely from behind their shelters. By his heroism, Konstantin Pavlyukov showed them that a Soviet pilot cannot be taken alive! He fought his unequal battle for 50 minutes. Of 24 bandits, the pilot annihilated around 20. It was not until a half hour later that his bloody body was seized by another band that hurried to this spot.

Soviet airborne troops that had sealed off the area in combat surrounded the band before dawn. Fearing retaliation for their bloody crime on Afghan soil, the dushman carried the body of the dead pilot to the road, where Afghan state security police soon discovered it. When our doctors examined Pavlyukov, they counted dozens of wounds he had received while still alive, but it was difficult to count how many wounds his body was violated with after he died.

The steadfastness, courage and heroism displayed by Senior Lieutenant Konstantin Pavlyukov, who entered into combat with a large band and who made his death a costly prize, are astounding, evoking admiration and pride. Who was he, this valiant pilot? What was he like when he was alive? How did he prepare himself for his moment of heroism?

Konstantin was born on 2 August 1963 in Barnaul. His father, Grigoriy Gerasimovich (he recently turned 50) was also born in Barnaul. He works as a construction brigade leader in Tsvety Altaya Sovkhoz. His mother, Svetlana Grigoryevna, is a waitress at the Altay Kray hospital. They are simple, modest working people. And that is the way they raised their sons—Konstantin the elder, and Vladislav the younger. The hero's brother is working in the same sovkhoz as a motor mechanic.

Konstantin dreamed of becoming a pilot from his childhood years. After graduating from secondary school in 1980, he submitted an application to the Barnaul Higher Military Aviation School for Pilots imeni Chief Marshal of Aviation K. A. Vershinin. On graduating from the school, Lieutenant K. Pavlyukov joined a certain air regiment of the Red Banner Carpathian Military District together with several other graduates. The novices were warmly received by squadron commander Major G. Strepetov, by his deputy for political affairs Captain A. Rybakov and by other officers. The lieutenants had barely worked themselves into the new routine when they learned that they would be cross-trained to new combat equipment. This trust pleased and delighted them.

"What astounded me most of all about Pavlyukov was his boundless energy, his persistence," flight commander Major K. Chuvilskiy shared his impressions with me. "I remember during the time that we were cross- training how he studied every detail ad nauseam, how he strove to get to the bottom of everything himself. He frequently exhausted his instructors with his questions. He insisted on getting clear explanations for everything. And his memory was excellent."

Pavlyukov took a very serious attitude toward his forthcoming service with the limited contingent of Soviet troops in Afghanistan. He knew that the situation there was not a simple one. This is why he acquainted himself especially carefully with the combat experience of pilots who had already been in that country, and with the tactics which they employed. He persistently exercised himself in group flying, and he improved his habits of combat use, rehearsing his actions in the conditions created by strong air defenses.

Just a few days after arriving in Afghanistan Pavlyukov immersed himself in the hard combat work, displaying valor, courage and excellent flying proficiency in his missions.

Afghan troops were conducting a combat operation in mid-November. Soviet aviators needed help. Major K. Chuvilskiy was put in charge of the group this time around. They took off. A chaotic jumble of mountains stretched out below. Following at the tail end, Konstantin prepared himself for serious combat. The mission of the flight was to knock out two temporary bridges set up by dushman in a hard-to-reach area near the population center of Asadabad. These bridges were used to ferry caravans carrying weapons and ammunition.

Soon they were in their prescribed area. The airplanes rushed into the attack. Each pilot worked on his own target. While the leader of the second pair suppressed dushman fire, Senior Lieutenant Pavlyukov struck the nearest bridge. The bridge could not be approached on its long axis—the canyon was too narrow. Approaching perpendicular to it gave too little time to take aim and drop the bombs accurately. It was hard and almost impossible to hit the bridge, but it had to be destroyed! Konstantin could see nothing but the river and the thin, swiftly approaching thread of the hanging bridge. Bombs away!

When Pavlyukov looked up as he recovered from his dive, he was dumbstruck: The mountains towered so high above him that it was like being in a rocky sack. He could see houses level with him. Dushman fired on the airplane from this kishlak as it recovered from its dive. The flashes of the gunfire were readily visible in the shadows of the canyon. But nothing could subdue Konstantin's joy: As he turned, he could see an unbroken glade above the river—"his" bridge no longer existed. The other one was gone as well. It had been struck by the commander's pair.

A week later, on 25 November, Konstantin was flying as a member of a pair in the vicinity of the city of Gardez. He was the first to discover a dushman rocket launcher on a mountaintop. Its crew was firing on a column of our fuel trucks. Flying under the cover of the leader, he blanketed this fire position with an accurate bomb strike and thus ensured the column's further unhindered movement.

Two groups took off on a mission on New Year's Eve into an area south of the city of Khost. One struck the dushman air defenses, and the other followed it into the target. While the rest of the crews attacked a large rebel base area, the pair in which Pavlyukov was flying as the follower suppressed dushman fire positions. Konstantin dove at the target after his leader. He could readily see dushman firing machineguns at him in the thickening twilight. Flashes could be seen on the ground, and the white trails of tracer rounds stretched toward the airplanes. Being hit seemed inevitable. But Pavlyukov did not turn away. His mind was focused on his mission.

"Kostya did not think about the danger," Senior Lieutenant A. Pochkin, his leader, spoke with his emotion building up. "I saw them fire a missile at him. But he flew straight into them fearlessly. It takes a lot of self-control to do something like that. He fired on the missile and destroyed it in flight, and then he stopped another one dead immediately after it was launched. After that he launched a volley of free-flight rockets at the rebel fire position. Then, turning his airplane, he covered me from fire from the ground. As he recovered

from the attack he looked around to see that both launcher crews had been suppressed. It was not until he had finished his attack that he realized how much danger he had put himself into. But he also felt a sense of moral satisfaction: He had completed his mission in the best way possible!"

Pavlyukov's comrades-in-arms—those who knew him well from several years of serving together with him—shared their recollections of him.

Senior Lieutenant V. Zemlyakov: "I met Kostya back in aviation school. His inquisitive, analytical mind attracted all of our attention way back then. He was a thoroughly developed individual. He loved literature, he knew many verses, and he was strong in mathematics. His extensive mathematical background saved us many times when calculating various maneuvers. And on the whole he was a simple, sincere, honest lad. He was an unselfish man of clean and clear thoughts. He lived openly, for people. When he was shot down and forced to fight, it was clear immediately that Kostya would not surrender. Konstantin preferred death to captivity. He fell like a soldier, like a hero."

Senior Lieutenant D. Kotov: "He lived simply, he did not seek any special benefits for himself. He never kept secrets, he never concealed things from others, he never played the hypocrite. He really recognized his duty, and he always remembered it. He did not seem all that different from anyone else, but there was the feeling that he was a real warrior, that he would not flinch in a difficult moment. And that is what happened. He loved debate. He was firm, unwavering and decisive when he debated, and he turned out to be the same in savage combat."

Senior Lieutenant V. Fedchenko: "I served with him ever since aviation school. He was a remarkable Siberian lad. Open, close and communicative. He was modest in his personal behavior. He never tried to be stylish—he was satisfied with what was available to him. And I would also have to say that there was none of the superman in him. He did not prepare himself to be a hero—at least in words. But as with all of us young pilots, somewhere in the depths of his soul he dreamed of the heroic, and of course he was always ready to commit an act of heroism. In a critical moment of his life he displayed all of his remarkable will, his full soldierly nature, and he acted like a real Soviet person, a communist."

Senior Lieutenant K. Pavlyukov served but 3 months in the limited contingent of Soviet troops in Afghanistan. But how full they were! How much he was able to do to provide brotherly international assistance to the Afghan people! Konstantin flew 70 combat sorties in the sky above Afghanistan, inflicting serious losses upon the dushman.

Communist Senior Lieutenant K. Pavlyukov accepted his last challenge in an extremely complex situation. But he was not thrown into confusion, and he made the sole correct decision. He committed an act of heroism that will serve as a lesson of courage and love for the motherland to many subsequent generations of Soviet soldiers.

11004

Restructuring Effort Improves Air Force Engineer Service

91440063f Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 87 (Signed to press 31 Jul 87) pp 14-15

[Article by Col V. Frolov: "Stumbling Block to Acceleration"; first paragraph is AVIATSIYA I KOSMONAVTIKA introduction]

[Text] "We need discipline, order and high culture in our work in all stages of reconstruction."—from a speech by CPSU Central Committee General Secretary Comrade M. S. Gorbachev at a meeting with laborers of Leninsk.

Cutting through the night-time darkness, the bright beam of the searchlight came to rest on the even surface of the landing strip: The last supersonic fighter of the flying shift was coming in for a landing. It had barely taxied off the runway when two red flares shot up into the sky—flying was over. It was now time for specialists of the air force engineer service headed by Guards Captain V. Berkutov, chief of the flight's technical maintenance unit, to go to work.

The aviators worked well together. Their spirits were high. The pilots had completed all planned exercises on schedule and with high quality, and the aviation equipment had operated faultlessly. During the flying shift the aviators displayed good coordination, and they acted efficiently, confidently, with a sense of responsibility. A senior chief attending the flying expressed his gratefulness to specialists of the air force engineer service, making special mention of the improvements in their occupational proficiency.

What was it that helped the aviators to rise one more step in combat perfection? The main thing that they added to their work was that their organization was better, and their work and military discipline was tighter. This of course is not an easy thing to achieve.

The first steps taken along the path of restructuring the activities of specialists of the air force engineer service gradually led to certain changes in their work. They began to "purge" themselves of connivance, negligence, deception and indifference. The exactingness expressed

by chiefs toward their subordinates increased. And mainly in the principal spheres of military life—in combat training and discipline.

"The work became harder of course," said Guards Captain V. Berkutov, "but it also became more interesting. We were made more accountable for the end result, and control over the activity of every aviator was intensified."

It stands to reason that it would be a simplification to say that all the management of the regiment's air force engineer service had to do to make changes for the better was to increase responsibility for the slightest deviation from the requirements of the regulations and for violations of military discipline. This was not the case at all. Before the reports could become more objective and truthful, certain comrades had to be strictly disciplined, and some even had to be punished for omissions and for attempts at embellishing the state of affairs.

Simultaneously with raising the demands they made of their subordinates, executive officers of the air force engineer service reinforced their efforts with a certain system of measures: They instituted the required degree of organization, they improved the quality of planning, and they oriented the entire service chiefly on raising combat readiness, improving flight safety, maintaining strict control over fulfillment of technical training plans and ensuring compliance with the lesson schedule, so that training time would be used only for its intended purpose.

Taken together, these and other organizational measures created the conditions under which certain positive changes in the work, training and competition of air specialists became possible. This beginning of the restructuring effort became a unique sort of reference point, the starting point of tangible changes in the aviation collective. The changes had to be reinforced and amplified. Executive officers of the air force engineer service began relying more widely on outstanding soldiers and on the leaders of the socialist competition.

Aircraft technician Guards Captain V. Burmistrov is well known in the regiment. The officer fulfills his official responsibilities faultlessly, and his is one of the best airplanes in the unit. One day he was called into the office of the regiment deputy commander for the air engineer service. The deputy commander did not conceal that he was pleased with the work of the aircraft technician.

"But I would like you, Boris Nikolayevich, to help other technical officers to work better. Your experience would be very useful to the younger officers."

The discussion turned to specifics: how to help this specialist or that. One needed valuable advice, another had to be cautioned against an ill-conceived step, and a third had to be shown by personal example how to service the warplane better.

The leader of the air force engineer service conducted similar discussions with Guards senior lieutenants S. Larionov, V. Kokunov, V. Britov and N. Vengrzhanovskiy. From my point of view, reliance upon such people is a specific contribution to implementing the party principles declared from the podium of the January CPSU Central Committee Plenum: supporting resourceful, thoughtful, energetic people who can and want to boldly march forward and who know how to be successful.

The changes in the regiment are already producing tangible results. The aviators have become more purposeful, circumspect and attentive in performing their functional responsibilities. As an example Guards Senior Lieutenant Britov discovered a serious flaw—failure of the material of the compressor housing in the vicinity of the peephole, while Guards Senior Lieutenant Bengrzhanovskiy revealed and stopped an oil leak in a valve of the hydraulic system. Such flaws could be detected only when an exceptionally conscientious attitude is maintained toward fulfilling ones official responsibilities, and when one's professional training level is high.

Changes toward the better are evident not only in the fact that the aviators have become more exacting toward themselves and toward one another. The best technical officers, who serve as models of discipline and technical culture, now take a personal stake in the successes their comrades-in-arms enjoy in their professional development. And if anyone deviates from the requirements of the manuals or a regulation, they are not shy to make the appropriate remarks.

In a word, the signs of the restructuring effort are noticeable in the Guards air regiment. And they are having a beneficial reflection upon the state of affairs in the unit. But as everyone here understands quite well, these are but the first steps. The Guards still have some reserves. Acceleration is being hindered in a number of cases by old approaches to solving various problems, by the fear of some officers to express their opinions openly. This attitude does not allow a real wind-up, and it will not ensure real acceleration.

One would think that it is clear to all that psychological restructuring and the fight for quality must begin by establishing exemplary order in all areas. The content of work done in this direction must be determined not by numerous appeals to fight for tight discipline, but rather by conducting effective educational work, by encouraging all communists to participate in it, and by creating an atmosphere of high responsibility and intolerance of

negligence, sloppy work, laziness, carelessness and indifference. As we were able to persuade ourselves, certain positive changes have been made in this direction in the regiment.

On the whole, the higher demands laid upon officers and upon all engineers and technicians are having a positive effect on the state of affairs in the unit. But this phenomenon has also been found to have a negative side as well. Recidivists suffering an old disease—that of not washing dirty linen in public, of creating the impression of apparent well-being—have appeared.

Some officers and warrant officers are still under the power of obsolete ideas; they are traveling the well-trodden road, with no desire to significantly alter the style of their work. It is one thing if for example an officer strives to restructure himself but finds that things do not all work out right away in view of objective causes. It is an entirely different thing if he strives not to do anything extra in his work, if he follows the principle of doing his own work but showing no concern for anything else. Such an attitude toward the work is the product of artificial limitation of the circle of one's responsibilities. There are also specialists who try to shift work which in their opinion is outside their "zone of responsibility" over to the shoulders of fellow workers while hiding behind verbal rhetoric on the importance of restructuring. But the times and the tasks of combat readiness persistently dictate that we need more lively, concrete work, we need fewer words and more deeds.

Violations of military, production and executive discipline committed by some aviators can neutralize the efforts of a large collective. In my opinion such violations are a real hindrance to restructuring, a sort of stumbling block to acceleration in the regiment. Thus some operations with cockpit hardware were not completed at the fault of Guards Warrant Officer A. Patrakov, an aviation specialist who worked unconscientiously on an airplane during preflight preparations. And Guards Captain N. Vasilevich, chief of the maintenance group, failed to adequately monitor his subordinate, counting on the notion that an experienced specialist with the class qualifications of a master was readying the aviation equipment for flight. A dangerous flying accident almost occurred as a result of the violation of production discipline.

The firm position taken by executives of the air force engineer service, who objectively reported everything to the command, was supported, inasmuch as it was a graphical lesson of truth to the personnel. The aviators were persuaded once again that each person must begin the restructuring effort with himself, that each person must first of all raise his personal responsibility for the state of affairs in the collective, and improve his own conscientiousness and organization in training and service.

Those who prepare aircraft for flying and ensure dependable operation of aviation equipment bear high responsibility, and their work is hard. Work cannot be divided here into main and auxiliary. Much depends upon each individual, and mostly the end result: the combat readiness of the collective and flight safety. Neither large nor small mistakes can be tolerated. This is the will of the times. We can no longer follow the earlier practice of condoning deviations from disciplinary requirements, we must not violate established order. Everyone must work like progressive Guards soldiers: Everyone must fulfill their official responsibilities competently and conscientiously.

11004

Procedure for Analyzing Tactical Elements and Alternatives Explained

91440063g Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 87 (Signed to press 31 Jul 87) pp 20-22

[Article by Maj Gen Avn G. Molokanov, doctor of technical sciences, professor: "Searching for a Tactic"]

[Text] In a combat situation the activity of a commander is saturated with difficult functions, one of which is that of making the decision to carry out an assigned mission. He carries enormous responsibility for the destiny of the people that are to carry out his decision in combat, and for the success of the effort.

A commander making a decision can stay on top of what is going on only if he fully masters the procedures by which to search for an optimum tactic for a mission. The experience of combat use of aviation can provide us with the general pattern of a commander's thinking in the course of decision making. Let us analyze some aspects of this process.

The commander receives his mission in the form of an order. One would think that everything is absolutely clear in this form of communication. But it is right in the stage of its analysis that the intensive process of the commander's intellectual activity begins. It should end with adoption of the optimum decision. The mission must be meticulously and thoroughly studied; then on this basis the intent and the basic idea of the senior chief can be deeply clarified, and the goal of one's actions in coordination with the actions of all participants of the overall mission can be understood and conceptualized. It is at this stage that the commander must precisely ascertain what result he is required to achieve.

The next step in work on the future decision is also important— estimating the situation. It is precisely at this stage that the commander comes up with questions for which the answers will basically serve as the foundation for the final decision. The main thing here is to

forecast the nature of the enemy's countermeasures. This requires revealing the disposition of opposing men and equipment with maximum accuracy and analyzing the capabilities of the latter against aviation when it is committed to combat en route to the region of combat operations and in the region itself. The goal of this work is to eliminate all uncertainties concerning the forthcoming combat sortie.

The commander has no right to base his conclusions on the enemy on arguments that evoke even the slightest doubt. A superficial forecast of probable countermeasures is extremely dangerous and can mean significant losses.

Evaluation of the fighting capabilities of one's own men and equipment also requires maximum objectivity. The corresponding attention must be devoted not only to precisely known quantitative indicators but also to the conditions in which the combat sortie will be carried out, from take-off to landing. Difficult though this may be, all circumstances that may even indirectly influence the end result of a sortie must be accounted for. Apparently insignificant details cannot be ignored in this effort, because combat is complex and contradictory precisely owing to the fact that indirect and secondary factors possess the capability of transforming unnoticeably into direct and decisive factors.

Sensibly subdividing proposed actions in the air in each stage of a combat sortie into basic components is a great art. The commander finds himself facing a contradiction in this regard: He cannot omit anything significant, but at the same time he must not become bogged down in secondary details. This pertains to the choice of valid alternatives for each component as well. It is important to constantly follow this principle when trying to surmount the contradictions in this stage of the mental process: The assessment must correspond to the situation, to the mission and to the limitations imposed to prevent losses.

To estimate a situation, the commander must possess rich experience, the capability for thinking creatively, a flexible mind, developed intuition and the ability to reduce a complex process of analysis to clear, synthetic conclusions. The main quality of the thinking done by a commander estimating a situation is, figuratively speaking, the knack for reducing the complex down to the simple.

I would also like to turn attention to another aspect of a commander's creative activity—his ability to reason in the manner in which his adversary would. This requires a large and diverse store of knowledge encompassing different areas—from the capability for utilizing the elements of mathematical game theory, to penetration into the psychosocial aspects of possible assessments, decisions, tactics and behavior of the enemy.

The obvious question would be: What can we do to keep from drowning in this sea of complexities and contradictions of the combat situation? There are some recommendations that can be given as the basis for the decision making procedure, for selection of the optimum variant of combat activities and for development of an effective tactic.

A commander working on his decision for combat activity would first of all find it expedient to use an approach that organizes and consequently simplifies his work. Such an approach is based on known psychological and logical considerations: seeking a bold tactical idea; utilizing a new and consequently an unexpected plan of forthcoming actions; analyzing all factors of the combat situation in light of the general tentatively adopted outlines of the planned version of actions, and in light of a certain approach in which the main goal of the operational flight coupled with approximate ways of attaining it is the leading factor of the logic.

A commander utilizing these simplifying methods should remember that thinking must not be constrained by prejudicial points of view. In no case can the results of all of the commander's analytical work be fitted to a previously adopted and quite possibly mistaken idea that does not correspond to the situation.

It is important to note that given the entire diversity of possible approaches, the complex process of searching for sensible methods of utilizing men and equipment must culminate in clear conclusions on the most suitable versions of action. A special table of the elements and alternatives of an operational flight may be recommended as one of the methods of simplifying the procedure of searching for a decision (see figure). The form of the table is traditional.

The table may contain the following elements and alternatives: 1— flight route (northern, central, southern); 2—flying altitude (profile) (minimum, variable, high); 3—form of maneuver (following radar shadows, antimissile, antifighter); 4—weapons (bombs, bomb clusters and bombs, free-flight rockets and cannons, guided missiles); 5—tactical groups (final reconnaissance, antiaircraft suppression and attack; target indication and attack; antiaircraft suppression, cover against enemy fighters and attack); 6—method of target attack (on the move from horizontal flight, approach from the rear and attack from a shallow dive, two attacks from a shallow dive); 7—ECM resources (zonal interference and individual ECM resources; jamming resources in the combat formation; zonal interference and jamming resources in the combat formation; not utilized in order to maintain covertness); 8—combat formation (open, closed, frontally dispersed); 9—method of organizing the combat formation (taking off in pairs and assembling en route; taking off in flights; taking off in pairs and assembling in a loop); 10—dismissal and landing (from a line, from a circle).

Elements / Alternatives	1	2	3 ...
1			
2			
...			
Number of Alternatives			

Table

Tabular representation of the main elements of a tactic and their possible alternatives makes it possible to subdivide the entire procedure of developing the tactic into a number of sub-elements, to envision the components of the general order of actions in the air, and to make sure that some significant factors are not left out; to evaluate measures by which to oppose enemy action; to analyze the "points" of interaction between elements of the tactic and the constraints introduced in support of flight safety, and to find solutions to possible contradictions; to divide stage-by-stage optimization of the tactic into elements that yield to precise quantitative analysis and elements that require military logical solution or expert evaluation or a heuristic approach.

The element-by-element alternative method of selection makes it possible to form the tactic stage by stage, thus facilitating the search for the best variant among those (3x3x3x4x3x3x4x3x3x2=69,984) variants which may be assembled out of the 10 basic elements in the table, with the corresponding number of alternatives for each of them.

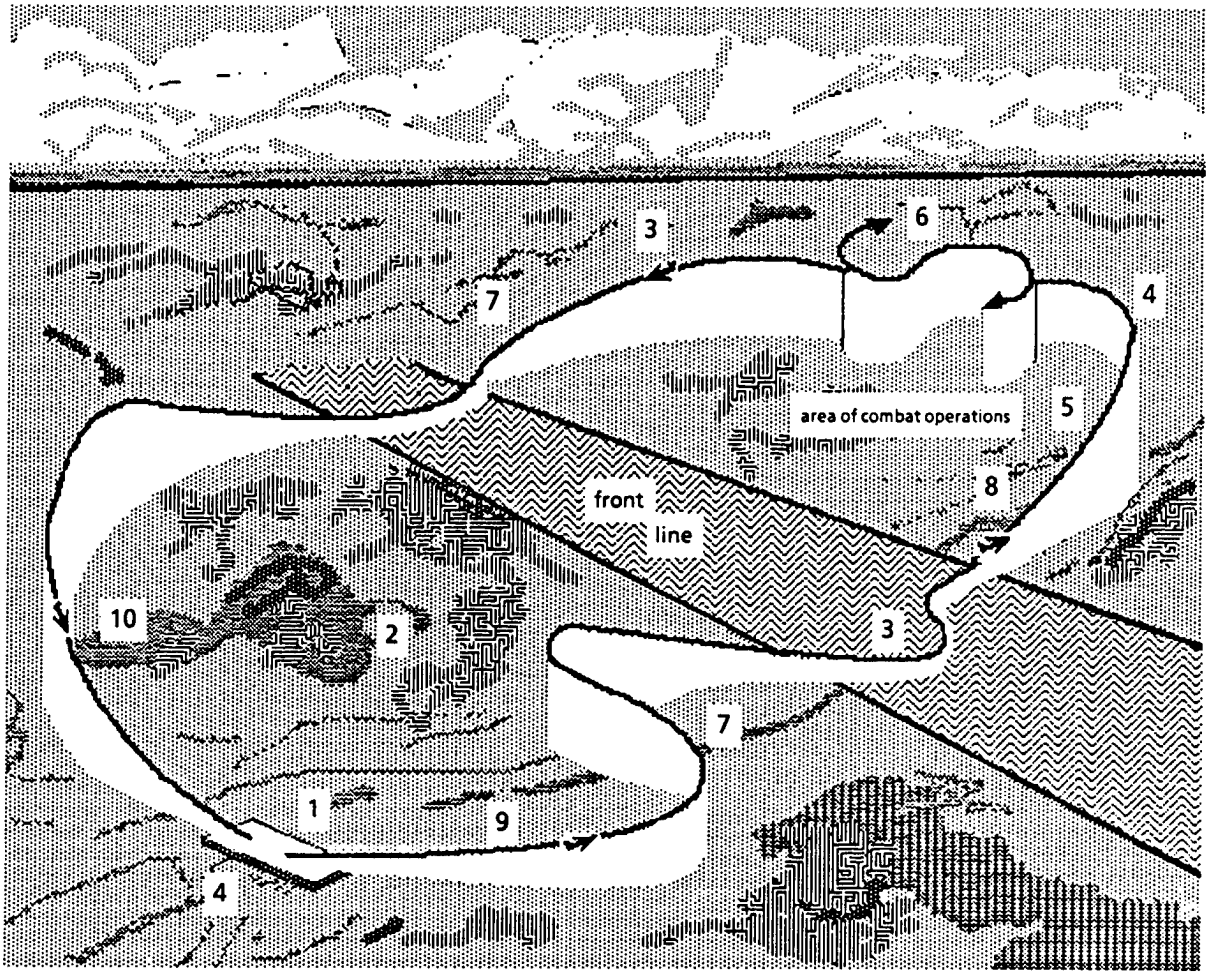
The reader should be cautioned right away that any fear of astronomical numbers of possible variants is groundless, because many elements are always found to be interrelated, and this means that a real and justified possibility appears for excluding certain elements of a variant that is selected automatically in the course of analyzing other elements that contribute to mutually related variants.

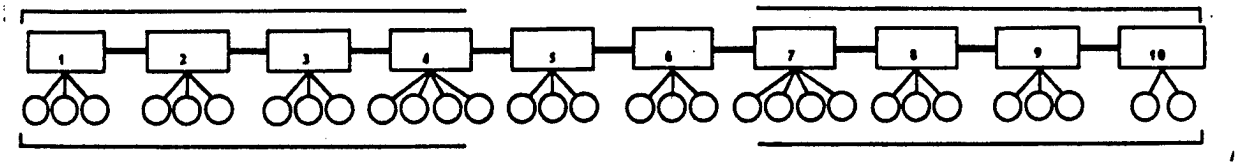
Thus in accordance with the example presented above, flight in radar shadows is often possible only at minimum altitude, and therefore these two elements, which are subjected to analysis separately, in fact merge into a single element. Often the situation itself makes it possible to reduce the number of elements and alternatives. But to keep from making serious mistakes, all of the most influential elements must be accounted for before reducing any part of them.

This procedure for developing a tactic is based on the principles of morphological analysis, the essence of which boils down to organizing analysis of the main factors from the standpoint of their influence on the end result, and systematizing the information in such a way as to simplify its analysis and synthesis in relation to all of the possible variants of the problem's solution.

Being an independent method of analysis, morphological analysis makes it possible to discern what information is necessary for a complete description of a complex phenomenon (a tactic in our case); what the structure and content of the components of an entire phenomenon might be; how many solutions a given problem may have, in principle so to speak (the degree of variation serves as an indicator of the creative saturation of the problem); the general procedure of possible stage-by- stage optimization, which entails successive selection of the best alternative of each element on the basis of their mutual juxtaposition and their analytical comparison.

Extensive introduction of mathematical methods, and especially of computers, into military affairs opens up fundamentally new possibilities for solving many problems, including that of developing an optimum tactic. But it must be remembered in this case that even an accurate result that is obtained on the basis of strictly quantitative calculations is not yet a solution. It is only the basis for it. It is only as a result of creative conceptualization of possible countermeasures (with regard for the situation's uncertainty) that the commander can arrive at a bold decision that would be a surprise to the enemy, one which would





require a justifiable level of courage, risk and boldness, and one in which the full responsibility for the proposed method of action would be evident.

One episode from the Great Patriotic War is instructive in this respect. An enemy field gasoline dump meticulously concealed in a certain ravine had to be destroyed at all costs in summer 1942 at Stalingrad. The command suggested a massed bomb strike to annihilate the fuel dump. According to tentative calculations this would have required a large detail of airplanes (the target was small, approximately 80x100 m).

Regiment commander I. Polbin proposed his own variant which precluded the need for intricate organization of the joint combat activities of three different air units located significant distances apart and not possessing communication with each other. Ivan Semenovich suggested carrying out the combat mission with two crews. His variant was the simplest and most dynamic from the standpoint of organization and the time available for preparations, even though it did contradict the existing methods of determining how many airplanes would be needed against such a target. He paired up with pilot L. Zheludev for the mission. They completed it brilliantly.

This is a graphical example of the strength of a commander's creative thinking—the main component of any tactic, of justified risk, of a nonstereotypic decision, and of a high sense of personal responsibility for a certain fulfillment of an assigned combat mission.

11004

Cavitation Can Cause Engine Shut-Down

91440063h Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 87 (Signed to press 31 Jul 87) pp 22-23

[Article by Lt Col P. Karpenko and Lt Col Yu. Kuzmin, candidate of technical sciences: "Air Has Appeared in the System"]

[Text] The airplane piloted by Major A. Kruglov was launched to intercept a test target. Operating in adverse weather, the pilot responded precisely to the commands of the interception controller. Flight recorder information revealed later on that his attack was indefensible.

But after he completed his attack the pilot was subjected to a serious trial. As he turned to his return course he sensed that the propulsion unit was not working right. "Spontaneous engine shut-down" flashed through his mind. And he was right. The pressure in front of the nozzles dropped, fuel consumption and gas temperature beyond the turbine decreased, the rpm of the engine's rotor dropped, and speed began to diminish. Kruglov shifted the engine control throttle of the failed engine to its "Stop" position.

After reporting what happened to the ground, the pilot was ordered by the officer in charge of flying to start the engine in the air. He attained the needed altitude and speed, turned on the "Air Start" tumbler switch and shifted the engine control throttle to the low-gas stop. All actions were efficient, and there was no confusion. There was good reason why the pilot had spent so much time in the trainers. He was prepared for this situation.

Monitoring the start-up, Major Kruglov watched the turbine rpm grow. And as soon as he was sure that the engine had surmounted low-gas conditions within the prescribed time, he turned off the "Air Start" tumbler switch and smoothly shifted the engine control throttle to higher power conditions. The rpm grew, and the engine operated normally.

In the meantime specialists on the ground who learned of the engine's spontaneous shut-down were already reviewing the possible causes. Suggestions were offered: The prescribed speed limitations were exceeded, the emergency stop valve had closed or the engine control throttle had shifted to the "Stop" position spontaneously, the automatic fuel control system had failed, a bird had flown into the air intake.... The final answer to the question as to the true cause could be obtained only after examining and testing the engine.

The airplane landed uneventfully. It was towed to the parking pad, where it was carefully examined. Nothing unusual could be seen. The engine was tested on the ground, but the failure did not recur, and all parameters were normal. Could it be that the engine had stalled?

The commission that was convened to analyze the flight recorder data did not reveal any of the signs of stalling—sharp fluctuations in rpm and drop of fuel consumption coupled with high gas temperature beyond the turbine. In the air, the pilot had not heard any unusual engine sounds and noises, or any characteristic pops or shocks. What was the problem?

Studying the readout of the warning signals, commission member Officer S. Orlov turned attention to the single instance of the command "Minimum Fuel Pressure" at the moment the engine shut down. He suggested that air had entered the fuel system. Further analysis of the engine's work and investigation of the technical state of the systems confirmed this version.

Why had air appeared in the system? It was revealed that the condition of fuel filters had been checked before the airplane took off. Poor rinsing may have caused the pipelines to fill with air. It was as a result of an interruption in the flow of fuel before the operating nozzles—an air plug in other words—that the engine shut down spontaneously.

During the technical critique it was explained in the greatest detail possible how dangerous it is for air to get into the fuel and hydraulic systems of an airplane. A case in which an air plug in the hydraulic system altered the nature of operation of controls, causing delayed action, was recalled as a confirmation of this. The airplane became harder to control, it began to pitch and yaw, and it lost altitude at accelerations greater than two units. Air can get into a system not only from without (special attention must be turned to this fact)— during work on the aviation equipment involving disconnection of systems—but also when gas and liquid vapors are liberated directly within the system in response to cavitation (formation of cavities filled with gas, vapor or their mixture in dropping liquid).

Cavitation may appear in a system in response to a decrease in outside pressure while climbing. In this case cavities filled with gas and vapor may form within a considerable part of a pipeline or even throughout its entire length. In this case the flow in the pipeline assumes two phases—a liquid and a vapor phase.

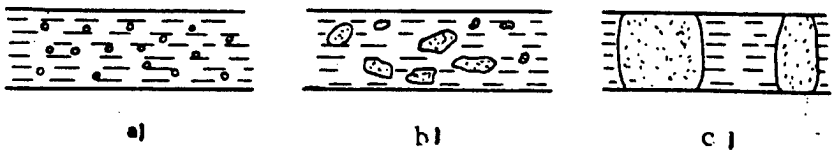


FIGURE 1 Motion of Liquid and Air Flow in a Pipeline

In the initial stage the vapor-and-air phase may take the form of fine, so-called cavitation bubbles uniformly distributed through the liquid volume (Figure 1a). Later on their number increases (Figure 1b), and then formation of vapor-and-air plugs is possible (Figure 1c).

Air is released from jet fuel in response to vibration faster than it dissolves. The fact is that the air bubbles cause additional mixing of the fuel, which forms a foam layer on the surface of fuel in tanks, and this layer intensifies mass exchange with the gas medium of the fuel tanks, and thus increases air accumulation. Cavitation causes noise and vibration in the pump and reduces its delivery and efficiency.

In centrifugal booster pumps, the cavitation phenomenon is usually observed in the intake pipes when the liquid flow attains the impeller blades, and in the through part of the impellers. The demand pressure at the pump intake is determined by maximum rarefaction generated by the impeller. It must be higher than the pressure of saturated liquid vapor. When these values are equal, vapor bubbles form in the pump, which are carried by the flow into the area of higher pressure. As a result the pressure of liquid surrounding the bubbles in the pump cavity grows, while pressure inside the bubble remains equal to the pressure of saturated vapor. Liquid vapor undergoes partial condensation, in the course of which the liquid microdroplets that are formed move toward the center of the bubble. Their collision is accompanied by an instantaneous local pressure increase—a hydraulic shock. Combination of these shocks is what creates characteristic pump noise.

A pump may experience surface and separation cavitation. It does not have a noticeable effect on the delivery volume, head and efficiency of a pump when it occurs as the flow enters the impeller blades. But when it develops throughout the entire space of the through part of the pump, complete failure of the pump is observed. This can cause interruptions in fuel feed and engine shutdown. Liquid jets penetrating through a bubble strike solid surfaces with enormous force, causing cavitational erosion.

In order that the pumps of all aircraft would operate reliably, the cavitation reserve of pressure in booster and transfer pumps must be 20- 30 percent of the pressure of liquid saturated vapor. Cavitational flow of liquid in pipelines is prevented by pressurizing systems in fuel or hydraulic tanks; in addition, booster pumps are installed. This is why timely inspection of the performance of pressurization systems, regular preventive maintenance of spray nozzles and, of course, careful purging of air from systems after disassembly and assembly are necessary conditions for cavitation-free operation of fuel and hydraulic systems (specialists servicing aviation equipment must not forget this).

11004

Lomonosov Military Aviation Technical School

91440063i Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 87 (Signed to press 31 Jul 87) pp 24-25

[Article by Lt Col R. Nagornyy]

[Text] Young persons who have decided to become aviation technicians are acquainted with the combat traditions of senior generations of aviators and the history of the region in their first days at the Lomonosov Military Aviation Technical School. The orientation begins with a visit to the training airfield—the sole operating airfield of the Oranienbaum springboard of the Great Patriotic War. After they come to understand the contribution of aviators to the defense of the cradle of the revolution—Leningrad—the cadets develop a stronger love for aviation and a deeper pride for its glorious representatives. And all doubts as to the correctness of the selected path of life vanish from the minds of these cadets—yesterday's schoolchildren.

The school is now working hard to fulfill decisions of the 27th CPSU Congress, of subsequent CPSU Central Committee plenums and of the 20th Komsomol Congress. The efforts of the command, the political department and the pedagogical collective are focused on restructuring the training process and raising the responsibility of all categories of aviators for the success of assigned work. Much attention is being devoted to nurturing morally steadfast, strong and courageous soldiers who have perfect mastery over modern aviation equipment and who are capable of utilizing it competently in combat.

Colonel I. Palagecha, captains V. Belokopytov and A. Onishchenko, who were awarded orders for fulfilling their international duty in the Democratic Republic of Afghanistan, lieutenant colonels A. Kiryushkin and M. Litvinovskiy, majors M. Dukhnevich, A. Kucherenko, V. Kulak and V. Chulochi and others have proven themselves to be highly qualified instructors. Military educators meticulously transfer their knowledge and their great working experience with aviation equipment to the cadets.

The school devotes special attention to preparing ideologically mature personnel. The cadets persistently master Marxist-Leninist theory, and each future officer is formed here as a harmoniously and comprehensively developed personality. Colonel V. Dugushin, majors A. Korniyenko and S. Sergeyev and other instructors in the social sciences help them acquire deep knowledge of the history of the CPSU, of the principles of military education and psychology and of party-political work in the Soviet Armed Forces, and to learn to fully utilize this knowledge in practice.

The school is continually improving its training materials and equipment, and searching for the most effective forms and methods of training, education and intensification of the training process. Much is being done to impart the habits of independent work to the cadets. They learn to think creatively and to find and utilize new and progressive ideas. Lenin Komsomol scholarship recipient Cadet M. Vasilyuk, Sergeant A. Gupalyuk, cadets O. Karpov and V. Pugachevskiy and others have been doing outstanding work for several semesters.

The school's graduates earn high marks during their apprenticeship in the troops and when they join their units after finishing their studies. Most cadets who serve apprenticeship are rewarded by the command of the line units for their active participation in efficiency and invention work, for their initiative and diligence and for revealing problems in the work of aviation equipment.

A short time after joining their regiments, the school's graduates are granted permission to do independent work. The careers of lieutenants A. Lukyanov, V. Chizhov, G. Yaruzhnyy and other young officers who graduated from the Lomonosov Military Aviation Technical School are going well.

The school is still young, and its first successes are pleasing. They are evidence that both the instructors and the cadets are confirming good traditions and traveling the right road.

11004

Aerobatics Still an Essential Element of All Flight Training

91440063j Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 87 (Signed to press 31 Jul 87) pp 28-30

[Article by Mar Avn A. Silantyev, Hero of the Soviet Union: "Aerobatics—Victory, Life, Safety"]

[Text] There is perhaps nothing surprising in the fact that whenever old friends who served together as pilots in the war congregate, they do not simply reminisce about the past. They "fly." Veterans will never forget the savage engagements with the enemy in the air.

Once a certain famous ace spoke with fire quickening suddenly in his eyes:

"Yes.... We flew such a merry-go-round in the air that after the battle I couldn't even recall what maneuvers I had performed. I could see clearly only my adversary. And no matter how he twisted about in the air, it was important to approach him as quickly and as closely as possible, in order to bring him down.... Now the times are different: Aerial combat does not require such complex maneuver, and aerobatics have lost a noticeable amount of meaning in combat."

I was going to object, but someone else broke in:

"We even exaggerate the significance of aerobatics when we talk about past battles. Did many of us really bring down fascists as a result of complex aerobatics? We mostly did so from simple maneuvers. That's fighters I'm referring to. And when it came to bringing down bombers, straight flying was the rule. Today you can annihilate a target on a collision course from considerable range with an air-to-air missile. What do aerobatics have to do with any of it?"

But others came to the defense of combat maneuvers and aerobatics. The discussion rose in intensity to a heated argument.

This attitude of some of the "Old Guard" toward the most complex maneuvers may be explained by ignorance of the present status of military aviation. I was astounded by the negative opinion concerning the art of aerobatics expressed by some pilots of the former generation, including ones who are in charge of aviation collectives today. Such aviators essentially pursue an "anti-aerobatics policy." It was then that the idea came to me to openly discuss aerobatic training, because the topic touched upon in this argument was a central issue of combat training. And I mean combat.

Let us try to analyze what higher aerobatics are, understand what purposes they serve, and determine the need for mastering them. Without going into the history of the subject, let me note that the maneuvering possibilities of the airplane are what raised it to the category of one of

the principal resources of warfare, and that maneuvering qualities took their place among the principal parameters characterizing the airplane's fighting capabilities. Moreover maneuver confirmed itself back in World War I in fighter aviation as the surest path to victory, and as the foundation upon which the tactics of aerial combat were to develop.

Aerial combat during the Great Patriotic War confirmed the validity of a famous formula: altitude-speed-maneuver-fire. Recall Pokryshkin's "laboratory." Combat maneuvers that predetermine a tactical advantage over the enemy and the "merry-go-rounds" that had become the topic of debate of the old soldiers are elements of the same order, in which higher aerobatics are paramount.

The quality of combat maneuvers depends directly on how well the pilot can control his airplane. It should be no surprise to anyone that maneuvers in aerial combat are more complex than in higher aerobatics. Perhaps this is true because higher aerobatics are governed by certain laws and constraints, while combat maneuvers are a product of improvisation, brought into being by the combatant under enemy fire in answer to the question of victory or defeat, life or death.

In this case there could also be no doubt in the fact that a combat maneuver is technically much harder to carry out than any pattern in higher aerobatics. This is why carefully planned training in higher aerobatics has been and continues to be the basis of combat training in free aerial combat. And the question as to whether or not we had brought down many enemy airplanes with higher aerobatics is purely rhetorical. The number that were brought down was exactly equal to the number of gifted pilots who in the course of their own creative efforts adopted higher aerobatic patterns in pure or altered form for the arsenal of their own combat maneuvers and tactics.

We can once again refer to A. Pokryshkin and his controllable barrels, which he jokingly called "tubs." The maneuver was simple, but its unexpectedness completely stunned the enemy. I could cite many other examples of using higher aerobatics in aerial combat, usually carried out in a form far from classical. Take for example attacking a bomber from below during a steep climb, recovering from the attack with a turning zoom maneuver, and immediately performing a second attack from above. It is entirely possible that someone might say that this is all well and good today when it comes to fighters, but what need is there of higher aerobatics in bombers and transporters, which do not utilize complex maneuvers? The answer is that higher aerobatics are needed as much for confident handling of an airplane today as they were needed before. Here are some examples.

One day in October 1941 a Pye-2 landed unexpectedly at our Sarozha airfield, near Tikhvin. The crew commander turned out to be an old friend of mine from pilot school, Junior Lieutenant Suvorov, a pilot of the 225th Bomber Air Regiment, to which we often provided cover during strikes on fascist airfields. The pilot said that he had to make a forced landing. In his words the aircraft felt sluggish, and it was not responding to its rudders well. While A. Vlasov, my squadron's senior technician, checked the airplane out, Suvorov described what happened to him.

During his return trip from a reconnaissance mission deep into the enemy rear, as he approached Gruzino at an altitude of 7,000 meters he was attacked by a pair of Heinkel-113's. Knowing the habits of enemy pilots, he tried to break away from them with a steep dive, but the fascists stayed with him. Nor did a deep spiral help. Then he decided on a last resort—diving straight down. But the enemy continued to hang on his tail. Then came an idea that saved the day: changing the direction of flight during the dive by turning the airplane. The Germans were unprepared for such "poor judgment" on the part of the Soviet pilot and lost sight of him. It took an improbable effort for Suvorov to wrench the aircraft back into horizontal flight. The acceleration was so great that the navigator and the gunner-radio operator did not respond to the intercom, and it was a long time before they showed signs of life again. Hugging the ground, and utilizing forest roads and terrain features, the pilot made his way to his own territory.

Some time later Vlasov came up to us with the news:

"Commander, there is no need to refuel your airplane, it won't be flying any longer: All of the load-bearing elements are deformed."

Had my comrade not been trained in higher aerobatics, he would not have been able to fulfill his important combat mission and live.

Here is another example. Craft commanders learning to fly the first jet passenger airplanes encountered powerful jet streams at the boundary of the stratosphere. On several occasions the crews found themselves in a non-standard situation, as the cosmonauts say today. There were several tragic incidents. All were at a loss to explain the causes of the accidents.

It was difficult to determine the causes because not one of the pilots who had encountered an emergency situation transmitted any reports to the ground. I think it was not until the third incident that the crew commander was able to report by radio that the aircraft went into a spin at an altitude of around 8,000 meters. The reasons why the airplanes had ventured into critical flight conditions were finally found, and the flight crews were given clear recommendations on piloting in these conditions. It is entirely clear that only a pilot trained in higher aerobatics could instantaneously analyze an arising situation, not lose self-control, report the incident to the ground and handle the emergency situation.

But this was all in the past. How do things stand today, with fighters for example?

Yes, modern weapons do allow a fighter to engage in missile combat from considerable range. But can we guarantee that close combat would be precluded with massed use of aviation? Considering the power capabilities of today's airplanes, such an engagement would inevitably spill over, as before, into a fluid contest, and become a real test of the ability to control an aircraft. All the more so because the maneuvering characteristics of modern fighters make them almost as nimble as aircraft of the Great Patriotic War. At the same time the technique of performing maneuvers aboard such airplanes has become significantly more complex, because they proceed within a wide range of speeds and accelerations. No, complex maneuvers will not fall into disuse in the foreseeable future in all arms and services of aviation.

Consider one generally uncomplicated element of flight—the climb. It is performed aboard a modern airplane under combat conditions at an angle of up to 80 degrees. Let us assume that it becomes necessary to immediately change the direction of flight during such an almost vertical ascent. If the pilot has not mastered higher aerobatics, he would require much more time for this operation than would a person who has assimilated aerobatics to perfection.

Finally, missiles launched by an adversary from an airplane or from a ground launcher would compel the pilot to perform a nonstandard, complex maneuver producing considerable acceleration in order to evade the strike. The effectiveness of such protective measures against the most sophisticated missile and artillery fire weapons has been decisively demonstrated in the local wars of recent decades.

Nor is the possibility excluded that an airplane damaged in combat may find itself in an attitude totally incomprehensible to the pilot. Only a pilot who is able to instantaneously realize where he is can recover in time, and then, skillfully selecting the flying conditions, end the flight favorably.

And is combat involving complex forms of maneuver not typical today of both fighters on one hand and attack aircraft and fighter-bombers on the other? One can learn to perform such maneuvers only by exposure to higher aerobatics, which are essentially a classical assortment of all of the elements of complex maneuver. Had it not been for the fact that our pilots were taught higher aerobatics properly in school, they could hardly have mastered the pitch-up bombing procedure required by some weapons so quickly and smoothly in recent years.

As far as the combat capabilities of modern air-to-air and surface-to- air missiles and the advertised inevitability of destruction of any aircraft by them are concerned, only a person who does not understand the physical nature of modern guided weapons can think this way. In the final analysis, after all, there is no such thing as an absolute weapon. There are probability characteristics of its effectiveness. And if the probability of destruction could be reduced by even 1 percent by a maneuver, only an undertrained and passive pilot would fail to utilize this chance. All future pilots must be taught higher aerobatics in pilot school, irrespective of what branch of aviation they are to serve in, or what types of airplanes they are to fly. And later on, throughout their entire flying career, they must constantly improve their habits of higher or complex aerobatics depending on the capabilities of the airplane.

Flying is rich with surprises even today, especially when it comes to the elements of combat use. It is not difficult to imagine the sort of habits a pilot must possess if he is to control an airplane in combat. High professionalism is attained through special integrated training. And not only purely technical training, but also to a no lesser degree, psychological training.

There still are commanders who conduct aerobatic training in flight school aboard basic trainers, or who are at least prepared to conduct such training, from the point of view of the equipment which the pilot is to fly in the future. When this approach is taken, from the very start of learning their profession future transporter and bomber pilots are deprived of the possibility for piloting an airplane within the entire range of its flight characteristics, and of learning all the secrets of flying proficiency, so necessary to the air warrior.

The detractors of aerobatics love to bring up the argument of flight safety. I am fully convinced that there is no such thing as flight safety per se. There is real and comprehensive professional training, which results in stable habits of ensuring a favorable outcome to any flight, even the most complex. And there is a simplified approach to professional mastery under the guise of concern for flight safety—an approach in which the latter is always ensured. We have slogans that appeal to action, to work, to difficult enquiry and to stern command responsibility for every decision and action. But unfortunately such appeals also sometimes serve as a substitute for the real thing.

Much is also being said today about moral and psychological training. I am fully certain that complex flying—aerobatic flying—is an essential means of developing the needed fighting qualities in pilots. When words which are designed to engender a need to acquire high proficiency rest on a firm foundation of flying skills, the moral, psychological, professional and, in a word, fighting qualities of the air warrior increase immeasurably.

Nor do I want to miss the opportunity of bringing up a historical argument that should be recalled to the opponents of aerobatics. Just before the Great Patriotic War the air force was augmented by a sizable number of pilots who had undergone accelerated flight training. It is no surprise that their aerobatic skills were weak. And the

accident rate increased immediately. In response, cautious zealots of the well- being of flight crews placed a ban on higher aerobatics. Not only in relation to young pilots, but in relation to all, including those who had undergone the test of fire and who knew from their own experience the value of being able to control one's airplane in combat.

This "breach" in the combat qualifications of Soviet pilots had to be closed in 1941-1942 at a high price. Our enemies were strong in all components of professional training. Moreover they had borrowed many things namely from us after studying our rich flying and combat experience, attending our maneuvers and observing our air parades and holidays. It was painful and embarrassing that a special order requiring sharp intensification of training in aerobatics and in combat maneuver for pilots in all branches of combat aviation was finally sent to the front and to the flight schools only after the fighting began, after unjustified losses revealed the need for intensifying the aerobatic training of flight crews.

Let me recall that all aces of our air force were fabulous aerobatic pilots, and they were never equaled in combat because no one was equal to them in the skill of piloting an airplane. These glorious soldiers made themselves totally independent of their airplanes, which became obedient tools for the execution of their tactical plans.

There is in my opinion one other important aspect of the matter—a moral one. It is the joy of flying. Is it really all that sinful to take pleasure in one's work, to receive real satisfaction from it? The work of flying, which is a combination of high physical, mental and psychological loads and which is associated with creative improvisation, with precise calculation and risk, with the display of courage, endurance and self-control, cannot but be inspiring. Such enthusiasm has always led us forward, toward self-perfection. It is precisely across this bridge that it is easier to lay the road to perfection in combat.

The conclusion from all of this is obvious: A pilot is obligated (and possesses the professional right!) to control his aircraft within the entire range of its technical flight characteristics, which means near their critical values as well. This is achieved through higher aerobatics, which develop the sense of flying, which is in turn the cornerstone of professionalism in flying. Success in combat and confidence in surmounting complex and emergency situations in the air will depend on how well developed this professionalism is. The art of aerobatics is the core of all flying and combat skills of the military aviator. Life confirms that this is so.

11004

Flight Safety Improved Through Analysis of Maneuvers

91440063k Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 87 (Signed to press 31 Jul 87) pp 30-31

[Article by Sgt K. Boyko and Sr Sgt D. Khachkovskiy, cadets, Kharkov Higher Military Aviation School for Pilots: "Flight Safety Can Be Calculated as Well"; first two paragraphs are AVIATSIYA I KOSMONAVTIKA introduction]

[Text] Today they are graduates of the Kharkov Higher Military Aviation Order of the Red Star School for Pilots imeni Twice-Awarded Hero of the Soviet Union S. I. Gritsevets. In all of their years as cadets they not only did outstanding work in their studies, but they also participated actively in the work of the military scientific society of the department of aerodynamics and flight dynamics. They earned the gratefulness of the command many times, and they possess several certificates of accomplishment. Interest in research activity has significantly expanded the range of their professional interests, deepened their knowledge and enriched their experience in taking an analytical approach to the problems of piloting technique and flight safety. This is precisely the sort of young pilots the air force units are awaiting: knowledgeable, inquisitive, searching, persistent pilots ready to travel independently on the road leading to flight and combat proficiency.

In the article below, Sergeant K. Boyko and Senior Sergeant D. Khachkovskiy raise an issue of undoubtable interest to flying personnel.

Much attention is devoted to safety when preparing for every flight. The possibilities of making mistakes and the methods of anticipating and correcting them are studied, responses to hypothetical situations are rehearsed, and the personnel are subjected to moral and psychological training.

There is also a special side of flight training that is aimed directly at excluding dangerous situations in the air—the study of flight safety measures.

Let us assume that a training exercise has been prepared for a pilot in which he is to rehearse the actions he would take in an attack on ground targets. What safety measures would be reflected in his notebook, and consequently in his memory? Here are some of them pertaining just to piloting the airplane: not pulling the control stick too hard, not exceeding the prescribed value of normal acceleration, finishing off a dive at an altitude of not less than 200 (600) m, avoiding transonic speeds.

One would think that when such an approach is taken, flight safety would be ensured just by the preparations for the flying assignment alone. But in the air, the situation may evolve in such a way that due to a mistake made by the pilot in determining the moment of attack

the slope of his trajectory turns out to be greater than what he calculated. If he fails to adjust the engine thrust, which is very difficult to do in such a moment, attainment of transonic speed is extremely probable, together with all of the ensuing complications.

What does this example tell us? From our point of view this is a manifestation of the passive nature of the particular safety measure itself (avoiding transonic speeds), which bears the nature of a prescription (or an injunction).

Obviously any safety measure must be active—that is, it must fall into the sequence of factors to which the pilot switches his attention, and into the sequence of his actions, as a preprogrammed element of the algorithm of the his actions in each specific flight stage—an element which is logically substantiated by flight dynamics and which is rehearsed until it becomes automatic.

Here is another interesting subtlety of flight safety. Usually, flight safety measures are developed for a flight as a whole, and they are not tied in with those moments in relation to which any one of the measures would apply. In principle, such a block of safety measures interferes with the attention switching pattern. The pilot is compelled not only to recall information having to do with safety but also select that information which is necessary precisely for the given instant of flight. This requires additional time and increases tension.

As we know, a psychological dominant (for example concentration of attention on fulfilling an assignment) often becomes a totally impenetrable wall to information that is absolutely necessary from the standpoint of the pilot's actions in the given flight stage. And if a safety measure exists essentially as a requirement concerning the end result, and not as a natural element of the pilot's actions, it will not penetrate into the pilot's thinking process, which is maximally burdened by current tasks.

Could this not be a cause of the "lack of discipline" displayed by flying personnel who violate categorical requirements, fail to execute commands and fail to perceive a clear danger?

A flight should be broken down into stages (legs) in such a way that each elementary piloting task would be associated with one specific safety measure. Consider for example the case where the pilot accelerates prior to a vertical ascending maneuver. Is there a need to recall all of the safety measures that had been studied before the flight? Obviously at this moment he is in no danger of stalling, and there is practically no risk of losing speed. The main and essentially sole objective at this moment is to store up a sufficient reserve of speed (kinetic energy). It would be logical to say that one safety measure applies here—attaining the minimum speed for committing to such a maneuver. After this objective is reached, the corresponding safety measure may be dropped from the memory.

The next piloting element is creation of the necessary acceleration, because inadequacy of the latter would stretch out the maneuver and force the pilot to deal with a power deficit in the second half of the maneuver. On the other hand excess acceleration is impermissible out of airplane strength considerations, and because speed would drop too intensively at the moment of commitment to the maneuver due to sharp growth of the inductive fraction of drag. In this case the active safety measure applying to this elementary leg of the maneuver is establishment of exact acceleration limits ny.

It may be objected that ny is already preprogrammed by the law of piloting. The answer to this is simple: When piloting law is adhered to without deviations, the safety problem is simply nonexistent.

One can analyze an entire maneuver in detail, and be persuaded that each leg of the maneuver that is logically defined by the dynamics of flight corresponds to one safety measure which guarantees against trouble connected with control of the airplane and which can be processed dependably by a one-channel information system—the individual.

It is important to find the answer to one other question: What should be done if a pilot discovers that a safety measure pertaining to the current leg of a maneuver is "disobedient"—that is, that the safety measure remains unfulfilled?

We think that there are grounds for following at least two rules of action in such a situation. The first is to abandon "normal" fulfillment of the maneuver consciously, exerting whatever volitional effort necessary. The second is to instantaneously and fundamentally restructure the pattern of attention switching and actions in accordance with an "emergency algorithm." Obviously the pilot would have to work out these "emergency algorithms" beforehand to the point where they kick into action unfailingly in the most complex situation.

Let us assume that in a descending vertical maneuver at a certain slope of the trajectory the speed attains a value making flight of the airplane at transonic speed inevitable (or fully possible in the pilot's estimation). Would it be reasonable to complete the maneuver "routinely," or all the more so continue the attack on the ground target? In this situation the pilot should doubtlessly focus himself completely on recovery from the dive. To do so, he can (and must!) "forget" everything except for actions which would ensure the fastest attainment of horizontal flight within the shortest possible distance. That is, he would have to immediately reduce the engine rpm and simultaneously activate his brakes; energetically create the maximum acceleration ny that strength considerations would allow and maintain it by instruments, since sensations may be misleading; be ready to push the control stick forward as speed decreases in order to avoid buffeting.

This would of course be the "wrong way" to attain horizontal flight, but if after making a mistake carrying the danger of entering the transonic zone the pilot concerns himself with the elegance of the maneuver, he may encounter significantly more serious complications.

Many safety measures operating as active components of piloting algorithms may be calculated and summarized in the corresponding tables. How can this be done?

Everyone is well aware of the formula used to calculate altitude loss during recovery from a dive:

$$\Delta H_{вып} = \frac{V^2_{вып}(1 - \cos\Theta_п)}{g\left(n_{y_{вып}} - \cos\frac{\Theta_п}{2}\right)}$$

It is not difficult to derive an expression by which to determine the acceleration required to ensure a specified minimum altitude for recovery into horizontal flight:

$$n_{y_{потр.вып}} = \frac{V^2_{вып}(1 - \cos\Theta_п)}{g\Delta H_{вып}} + \cos\frac{\Theta_п}{2}$$

Using this formula it is easy to calculate the acceleration needed for recovery from a dive when there are deviations from the calculated velocity, trajectory slope and altitude at the moment recovery to horizontal flight begins.

Naturally it would be expedient to use available computers, including microcomputers. It would be suitable to carry out such preliminary calculations for any pattern and for any trajectory. These, then, would be safety measures that are precisely quantitative in content and active in essence.

There is an entire class of instructions of diverse physical meaning designed to preclude dangerous situations in the air. In visual search, for example, a minimum distance has been established for approaching an airborne target in the absence of visual contact. Could it be that this categorical requirement is sometimes violated because it is psychologically difficult for the pilot to abandon his assignment?

It seems to me that dangerous approaches could be excluded more reliably by establishing not a minimum distance but a maximum permissible speed of approach depending on current distance. Understandably this speed should become zero at the established distance. Clearly the grade a pilot receives for the tactical aspect of such a sortie would not be high, but he would at least acquire some experience in visual search and practice the elements of combat use. And total failure of the assignment would not occur.

We have done nothing more here than introduce the problem. Each flight should be preceded by thoughtful and comprehensive preparation, and especially in regard to safety. But safety cannot be reduced to requirements, be they even the most rigid and categorical.

Requirements and instructions are the basis of calculating actions in the air, ones which will transform these actions into an active factor ensuring a favorable outcome to the most complicated flight. To name the safety measure is half the battle. To find its exact quantitative indicator is the second half, which is no less important to success.

11004

Grounded Pilot Longs for Reinstatement

91440063l Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 87 (Signed to press 31 Jul 87) pp 32-33

[Article by Col A. Shtaltovnyy, USSR Armed Forces Central Flight Safety Inspection, and Col A. Dmitrichenkov, special correspondent: "Grounded"]

[Text] The letter to the journal's editor was substantial, and from all appearances it had been written after lengthy deliberation. The events were presented in chronological sequence, statements were adequately documented, and as was confirmed later on, the facts were evaluated objectively, self-critically. And although the letter discussed the fate of a single individual—the author himself, it helped to reveal a problem that could not but raise concern. The problem was summarized in the concluding lines of the letter written by former military pilot Lieutenant Pavel Neklyudov:

"...It was for the sake of flying that I joined the army, and I cannot imagine life without it. I cannot sit by silently while others fly. I feel that I could still be useful as a pilot, that I will be able to justify any trust shown in me, and that I could demonstrate by my actions that the large amount of money that was spent on my training was not wasted."

It is a frank and eloquent admission. It is a reflection of a real love for the sky imprinted on the heart forever. To understand what happened to P. Neklyudov, we need to go back a year.

The particular air regiment was making its preliminary preparations for flying. For two shifts together. The planning tables called for an exercise that had to be carried out at night, and one day flight to the training ground was planned additionally.

Everything was going by the numbers. The air warriors carefully analyzed the features of the flying assignments and rehearsed their work with the cockpit equipment.

And Lieutenant Neklyudov made preparations along with everyone else. It should be noted that this was the first time he was to participate in the planned exercise. This is why, in the words of his fellow servicemen, the young officer put all of his effort into it.

"We flew our shift on the first of September. And after it, the regiment commander made some changes in the planning table, adding two sorties to be carried out by flights. Even the monthly plan did not contain this exercise. And of course, there had been no general preparation for such an exercise. Neither I nor Lieutenant V. Zhivtsov, the follower of the first pair, had ever flown a sortie as a flight before.

"I learned of the changes in the planning table after flying was finished. We were told to diagram these flying assignments in the notebooks we used for preliminary preparation.

"On the following day I acquainted myself with the assignment (as described in the combat training program) and drew the diagram of the exercise. Before we took off we went through the assignment once again as an entire flight...."

The flight's first sortie was successful. But things did not turn out so well in the second. The order from the district air force commander reads: "...prior to performing a right turn Major V. Badayev, the flight leader, failed to inform his followers that he was about to start the maneuver. During the turn Lieutenant Neklyudov, the follower of the second pair, lost sight of the leader's airplane but did not report this fact. Later on, attempting to regain his position in the group, he acted incompetently and collided with his leader. As a result of the collision the airplane received minor damage and had to land at its home airfield.

"Unsatisfactory organization of the flying was the main cause of the collision, and it was only by chance that it did not result in a serious flying accident...."

Yes, the organization of the flying was unsatisfactory. This is evident from the materials of the investigation conducted in the unit. It was established that squadron commander Major V. Badayev and his deputy for political affairs (the leader of the second pair) had taken advantage of the regiment commander's silence and lack of control, they did not attend the preliminary preparations, and they did not prepare for this flying assignment. And therefore they did not adequately fulfill their responsibilities of controlling their followers. It is no wonder that Lieutenant Neklyudov "lost" his leader on such a background.

There is something else that is amazing. In an attempt not to lose face, the regiment decided to conceal the omissions in flight preparations and the negligence. When we talked about this with Colonel Perekrestov, he expressed what seemed to us to be sincere amazement:

"What do you mean there were no preparations?!"

It was not until the specific shortcomings were itemized that he noted in a conciliatory manner, though still with his prior vagueness:

"I can't remember that day exactly anymore. But something must have happened to warrant such action...."

What was this, a lack of command experience or an effort to protect one's flanks? Perekrestov was a sly one. He had not forgotten—he simply wanted to dissociate himself from that day, to relieve himself of a share of the responsibility both for poor organization of the flight shift and for its unfavorable outcome. But a spade must be called a spade, and there can be no exceptions in this.

Let us briefly recall the way things were. The regiment did not perform any supplementary testing of the readiness of the pilots for flying on the second of September, and when the planning table was redrawn they failed to account for the mutual locations of the aerobatic zone and the flight route to the training ground, or their influence upon flight safety. Major Badayev excused himself from the unit at an important moment with Colonel Perekrestov's permission.

The chain of all of the different mistakes that led to the dangerous near-accident would have been found to be a long one. This is precisely why some officials in the regiment gave in to the temptation to protect themselves by creating a point man. Lieutenant P. Neklyudov was fully suited to this role: He was obviously at fault, and when it came to career experience he was a young greenhorn.

"Neklyudov is not pilot material," the regiment commander argued every chance he could, even trying to persuade us of this. "He doesn't have the right stuff."

What it comes down to is, since he is useless as a pilot, let him take point. To put it bluntly, the idea is simple: As long as he is taking point, let him take the fall.

The higher command did not of course limit its punishment just to Lieutenant P. Neklyudov alone. Thus Colonel F. Perekrestov was reprimanded for failing to fulfill his official responsibilities, Major V. Badayev was demoted, and others were punished. One might think that this would put an end to it: Unprincipled behavior and negligence had been condemned. But what about the problem of developing young pilots?

This problem has been a focus of concern for a long time in many units and subunits. Beginning with their first days of service, graduates of flight schools are surrounded with attention and concern, all of the conditions they need to improve their combat proficiency are created, and they are given assistance in acquiring confidence in their strength and surmounting the difficulties that are unavoidable at the beginning of an officer's

career. This kind of experience has been discussed in our journal. Nonetheless, the editor still receives alarming letters. Evidently things are not going well everywhere yet, meaning that it is too early to consider the matter closed. We cannot ignore the fact that we still encounter commanders and political workers who substitute meticulous individual work with recent graduates of flight schools by scoldings and verbal abuse, or that there still are young officers who display a lack of concern and who attach little value to their chosen profession. Such facts are dangerous symptoms which sometimes evolve into a chronic ailment of entire collectives.

Lieutenant Neklyudov writes in his letter that he loves his work as a military pilot very much, and that he would be faithful to this profession forever. He does not see himself as a "desk pilot," and to him, losing the keys to the sky is the greatest loss of all. You can't help believing the young officer. He wrote from the bottom of his heart, with a clear conscience.

But there is one thing that disturbs us. More so than in any other occupation, in flying, that which is desired does not always become reality. Dreams are not enough: It is important to confirm one's destiny in flying. Could Pavel Neklyudov do this? Does he possess the needed reserve of strength? Let us recall the words of the regiment commander: "Neklyudov is not pilot material. He doesn't have the right stuff."

An air warrior's flight record contains a sufficiently accurate and objective description of him. We took a look at it. Lieutenant Neklyudov successfully cross-trained to an airplane with which he had not been familiar before. The number of practice flights was within the limit. The circling checkout flight with the instructor prior to a solo take-off was carried out without a hitch with an excellent grade. Subsequent tests of the different forms of flight training did not produce any unfavorable remarks. The pilot's actions were scored only as good and excellent. And the squadron commander and other experienced air warriors acted as the testers.

Lieutenant P. Neklyudov also successfully mastered piloting technique at moderate and low altitudes. He was granted permission to fly in adverse weather. There were no complaints about his preparations for paired flying. It is noteworthy that he flew his checkout flight for piloting technique together with the regiment commander, who awarded a satisfactory grade to the pilot's actions and gave the "O.K." for training flights in paired combat formations at low altitude.

Success followed the young pilot in combat flying as well. He was one of the first to complete his checkout flights having to do with fire and bombing missions against ground targets, and he acted competently on his own in this phase of training. He received an outstanding score in his checkout flight for piloting technique, for combat use and for navigation. He was tested by the regiment commander. On the basis of the test results Lieutenant P. Neklyudov's name was submitted for the class qualifications of "military pilot 3d class."

As we can see, there were no special difficulties in the young officer's flight training. Thus it is hard to understand the logic followed by Colonel F. Perekrestov, in accordance with which P. Neklyudov was classified with unusual levity as an unpromising pilot. How does Perekrestov explain this?

"It doesn't matter to me whether Neklyudov will fly or not. But his flying wasn't all that great. There were several occasions on which he had to be grounded."

Major V. Badayev believes this assessment to be clearly unjust:

"Let me say frankly that Neklyudov does exhibit good potential for flying. He prepared conscientiously for flying. But he did succumb to a sense of false embarrassment for the fact that he 'got lost' during the turn. Anyway, we were not fully in control of the situation either."

And here is the opinion offered by the flight commander, Captain T. Mamkhegov, who is presently performing his international duty in Afghanistan:

"Pavel Neklyudov was the best pilot in the flight. He flew confidently, competently. He knew the aviation equipment well. He had never been personally responsible for near-accidents. He's a very conscientious lad. He couldn't be anything else. He was born to a large family. His father is a veteran, a group two invalid and a communist. I wrote at the time of his certification that he was worthy of appointment to the position of senior pilot. Later on the report was almost completely rewritten without my knowledge. And as for him, he would rather fly than anything else!"

Such are the diverse evaluations.

After his appointment to the position of assistant officer in charge of flying, in another unit now, Lieutenant P. Neklyudov attacked his new responsibilities with relish. They took notice of him here. No matter who we talked with, the opinion was the same: He was a conscientious, diligent, disciplined officer. And they sympathized with him: This man belongs in the sky!

No, the people in this unit are not indifferent to the lieutenant's fate. They know how hard it is for him without the sky. They are trying to help him. They are hoping that the time will come when he will acquire his wings once again.

Neklyudov himself also continues to believe this. His desire to return to flying work is well known in the regiment, in the formation and in the district air force headquarters. And yet he wrongfully expresses anger at

the "procrastinations" of his senior chiefs in his letter. After all, in accordance with the USSR Armed Forces Disciplinary Regulations the term of his punishment must be 1 year. Yes, this term has now expired. We can say that a key moment has come in his destiny.

When you get right down to it, Lieutenant P. Neklyudov himself has a very important moral conclusion to make from that crucial near-accident. He had in fact not shown his best side back then. The pilot could not have, and did not have the right to, be ignorant of the requirements of the flight manual: "When a follower loses sight of his leader's airplane (the lead airplane), he is obligated to immediately withdraw from the formation in a direction that provides good visibility for unconstrained maneuver, and report his actions to the leader by radio...." Why had he not done this at that time? The false embarrassment that Major V. Badayev mentioned is not an excuse. Something else was behind it. But what? Let the answer to this question serve as that moral conclusion for Pavel.

Much depends now on the pilot himself. After all, as is true with moral maturity, professional maturity does not come about on its own. It is the result of hard work requiring great persistence and purposefulness and full exertion of spiritual and physical strengths. As far as Neklyudov's return to a flying position is concerned, this is the prerogative of the higher command. All we can say is that while the issue is not a simple one, it is fully resolvable.

Before taking off after our visit we met with the district air force commander. He was well informed about the state of affairs at the places we had visited. He said that many of the regiment's shortcomings were the product of a faulty style of leadership of the personnel, and that Colonel F. Perekrestov was chiefly to blame for this. And when the topic turned to P. Neklyudov specifically, the district air force commander refrained from making categorical statements. It was premature at that moment: The term of the punishment had not yet expired. But what about now? Will the keys to the sky be returned to the lieutenant? We would like to believe yes. Let us recall the words of Captain Mamkhegov: "As for him, he would rather fly than anything else!"

11004

Western Portable Antiaircraft Missile Systems

91440063m Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 87 (Signed to press 31 Jul 87) pp 36-39

[Article by V. Mikhaylov and R. Ivanov based on foreign publications: "Killer Missiles"]

[Text] In their efforts to foil the process of national pacification, to prevent peaceful resolution of the Afghanistan situation and to maintain tension in this region, reactionary forces, and chiefly the USA and its allies in the aggressive NATO bloc, have recently significantly expanded deliveries of modern weapons to rebel bands, including Stinger, Blowpipe and other missiles. With these weapons, dushman commit bloody crimes on Afghan soil.

As was reported earlier, on 11 June 1987 an An-26 chartered by the civilian airline company Bakhtar al-Vatana [transliteration], which was flying from Kandahar to Kabul, was brought down by an American-made Stinger missile over Shahjui Region, Zabul Province. The passengers, among whom there were women and children, perished. Data from the "black box" removed from the airplane revealed that one of the engines of the An-26 had suffered a powerful impact. Its force twice exceeded the impact of the missile that struck the same type of airplane in Khost Region. Moreover interpretation of these data by competent organs showed that the airplane was flying at the maximum range of a Stinger missile. It is believed that a modification of this missile was used against the An-26—a more-powerful POST-Stinger missile, which the Pentagon now supplies to the dushman.

America's closest NATO partner—Great Britain—is highly active in organizing and conducting subversive activity against Afghanistan. Ignoring Kabul's appeal to begin political dialogue, the military- political leadership of this country has significantly increased deliveries of weapons and ammunition to antigovernment forces. Mercenary aspirations of British imperialism are playing an important role in this. Arms supplied to the dushman by London are generously paid for by currency that finds its way via official and unofficial channels to the accounts of English companies involved in arms production. In the race for profits, some English companies even violate the country's laws. For example it was reported in the British press that Short Brothers and Harland Ltd. is delivering Blowpipe antiaircraft missiles to Afghan dushman in violation of export laws. They are being sold—one would think not without the awareness of the government cabinet—to Oman, Thailand and some other countries.

What is the nature of these and other killer missiles that are being supplied so generously by the Pentagon to reactionary forces attempting to halt the progress of history with force?

The Stinger portable antiaircraft missile system is a development of the Redeye system. In comparison with its predecessor, which can be fired only at subsonic targets in chase mode, it possesses higher characteristics and it can hit targets flying at near-sonic speed. It consists structurally of a launcher (tube) with an optical sight, the missile and auxiliary equipment. The antiaircraft missile is guided to the target by an infrared passive head inside the nose-cone of the missile. The homing head, which operates in the 4.1-4.4 micron range, can

intercept the target not only in chase mode but also on collision courses, and it can guide the missile both to jet airplanes and to helicopters and piston-engine airplanes.

The missile is stabilized in flight by rotation imparted by folding tail fins. The middle part of the body contains a high-explosive fragmentation warhead and a proximity fuze. The solid-propellant propulsion unit consists of a booster charge and a solid-propellant rocket motor. The launcher tube serves simultaneously as both a missile transport and storage container. The optical sight is used to detect and track the target, to estimate the distance to it and to inform the operator by acoustic and vibrating signals that the target is locked on. Expendable batteries that are plugged into the launcher tube when the system is readied for use provide power to the missile and cool the infrared receiver of the homing warhead prior to launch.

The principle of operation of Stinger and Redeye antiaircraft missiles is as follows. After the operator detects the target visually or receives a target indication signal by radio, he mounts the system on his shoulder, aims it on the target with a sight and identifies it with IFF. On making the decision to intercept, he presses a switch to energize the system: In a period of 5 seconds liquid argon flowing from the power-and-gas unit cools the homing head's infrared receiver to the required temperature, and then power is supplied to the electronic units. After this, the gyroscope is placed in rotation, arrested and adjusted with the sight viewfinder. On receiving a signal indicating that the target is locked on and being tracked, the operator releases the gyroscope, introduces the lead angles by changing the position of the launch tube, and launches the missile by squeezing the trigger. After 0.6 sec the booster charge propels the missile out of the launch tube. The sustainer ignites after the missile travels a safe distance from the operator—about 8 m.

In the initial flight phase the missile's homing head is guided to the airplane as a point source. As the missile approaches the target, the gas jet becomes the homing point, and therefore approximately a second prior to contact a lead signal is introduced into the control system to aim the missile at a point aligned with the target's direction of flight so that the impact will occur on the aircraft body (cruciform folding control surfaces are present in the front part of the missile body).

In order to improve the fighting capabilities of the Stinger system and increase the effectiveness of fire in the presence of interference, the USA developed, and began series production last year, of a new two-range (infrared and ultraviolet) POST homing head. In contrast to the Stinger antiaircraft missile, the POST-Stinger has an additional ultraviolet channel (with a wavelength range of 0.2-0.35 mm). Hypothetically the guidance channel (infrared or ultraviolet) is selected on the ground before the missile is launched. When the system uses the ultraviolet channel, the missile is guided onto the portion of the sky shaded by the target's body, where the intensity of the ultraviolet background is minimal.

The Blowpipe antiaircraft missile can hit subsonic airborne targets only within visual contact. It uses a radio command homing system which, in contrast to antiaircraft missiles with an infrared guidance system, makes it possible to fire on various targets irrespective of the intensity of their infrared emission, and at any aspect. Besides the missile, the system, which is serviced by a single person, contains a launch tube-canister with an aiming unit that includes an optical sight, an infrared device that measures deviation of the missile from the line of sight, a control grip and a radio transmitter. Tracers in the missile's tail section permit automatic tracking of the missile by an infrared device and help the operator visually track the missile's flight.

This system functions in the following manner. The operator visually detects and identifies the target and tracks it with the cross-hairs of the optical sight. When the target enters the missile launch zone, which is determined visually, the operator squeezes the launch trigger. The missile is propelled out of the tube by a booster charge, and after 0.7 sec, 30 m from the operator, the sustainer ignites. An automatic tracking system operating in the initial section of flight guides the missile to the line of sight. An infrared device in the homing apparatus determines the missile's deviation from the line of sight. A control command is generated on the basis of the error angle and transmitted to the missile by a radio command line. The automatic tracking system operates for 2-3 sec. Subsequent guidance of the missile until its contact with target is effected manually. The operator tracks the missile and the target with an optical sight. If the missile deviates from the line of sight, he manipulates a joystick to turn the missile in the appropriate direction until it aligns with the target image.

The shortcomings of the Blowpipe antiaircraft missile noted by foreign specialists include the impossibility of using it in adverse weather and at night, the limited possibilities for use against maneuvering and high-speed targets, and inadequate protection of radio command transmission lines from interference. For these reasons Great Britain has developed and initiated series production of an improved modification of the system—the Javelin. It uses a semiautomatic line of sight command guidance system, which reduces the minimum effective range from 600-700 to 300 m and increases guidance accuracy at maximum range.

In contrast to the base model, the Javelin antiaircraft missile uses a miniature television camera unit in place of an infrared device to track the missile's tracers. Signals from the missile and the target are displayed on its screen. A computer selects a control signal proportional to the error between these signals, which is then transmitted to the missile by a radio command line.

Thus the operator is relieved of the task of controlling the missile, which simplifies his work; however, this may make the Javelin less resistant to interference than the Blowpipe.

Sweden's RBS-70 antiaircraft missile, which has a laser homing system, is intended to intercept subsonic and supersonic low-altitude airborne targets flying on collision courses. It consists of a laser homing system, a stand and seat for the operator, and a missile carried in a launch tube-container. It weighs 80 kg. The system is carried disassembled by a crew of three, who can assemble it in 30 sec. The missile has a high-explosive warhead with proximity and remote laser fuzes.

The operator detects an airborne target by independent visual search, or by target indication from a radar station. In the latter case data defining the coordinates, speed and course of the target and fire control commands are transmitted to the system by a radio or a wire conductor. After taking rough aim the operator locks the target into the optical sight and then uses a coordinate grid to measure the range to it. Next he superposes the cross-hairs of the sight over the target and turns on the IFF instrument. After making his decision he turns on the laser unit and launches the missile. The missile is guided to the target simply by keeping the cross-hairs of the sight over the target. This maintains the direction of the laser beam which the missile rides. A laser radiation receiver in the tail section of the missile perceives the missile's deviations from the laser beam and generates signals proportional to this deviation. An autopilot computer generates control commands to adjust the missile's flight on the basis of these signals. A variable focal length lens in the laser transmitter decreases the beam diameter as the missile approaches the target, thus raising guidance accuracy.

It is pointed out in foreign sources that the laser beam guidance system used in the missile system is highly effective when intercepting low- flying targets, but it can be used only during the day, and in good weather.

The portable Mistral antiaircraft missile system carries out tasks similar to those of the Stinger and Redeye systems. But it is more sophisticated. According to the developers the system is capable of hitting airplanes at ranges to 6 km and altitudes to 3,000 m flying at speeds to 440 m/sec.

The system consists of a missile in a transporting and launching canister, an optical sighting device, an IFF system and an infrared sight used to launch missiles at night. All of its equipment is divided into two packages weighing 20 kg each, meaning that it can be transported by two persons. A tripod and a seat for the operator make launching of missiles more convenient than with shoulder-launched antiaircraft missiles. In addition it takes less time to sight the weapon and its accuracy is greater, which is important when it is necessary to ensure lock-on at ranges of 8-9 km.

The missile's infrared homing head has an octagonal pyramidal lens, which in comparison with a conventional spherical lens reduces drag and thus produces higher missile velocity and improves maneuverability, especially in the final phase of guidance. The Mistral missile is equipped with a matrix multiple-unit receiver that picks up infrared radiation in the 3-5 micron range, which significantly raises the sensitivity of the homing head and its resistance to interference. High sensitivity widens the possibilities for use against targets with a reduced infrared radiation intensity, both in chase mode and on collision courses. It is noted in the foreign press that use of a matrix receiver together with a digital signal processing system provides sufficiently reliable protection against infrared traps, the sun and brightly lit clouds.

The weight of the warhead, which contains tungsten balls as its destructive elements, is 3 kg—significantly more than the weight of the warheads of the Redeye and Stinger antiaircraft missiles. It is equipped with proximity and laser remote fuzes. In the opinion of the developers, use of a laser fuze makes it possible to exclude premature detonation of the warhead due to noise from various objects, trees and so on.

The missile's propulsion unit consists of a booster and a sustainer. The booster imparts a velocity of 40 m/sec to the missile. After the missile clears the launch canister the booster is jettisoned, and about 15 m from the operator the sustainer ignites, accelerating the missile to its maximum velocity of 800 m/sec. The missile's high speed reduces the time of its flight to the target. Western specialists estimate that a missile would need not more than 6 sec to reach a helicopter hovering 4 km away.

New missiles—the Thunderbolt and the Starstreak—were developed as replacements of the Blowpipe antiaircraft missile by order of the British defense ministry. These missiles are to be used with the existing sighting devices of the Javelin system. The Thunderbolt and Starstreak are unique because of their high flying speeds (Mach 4). They may be launched from a multiple launcher mounted on a terrestrial vehicle, or they may be transported by one person and shoulder-launched.

The Starstreak missile is intended to provide direct air cover to ground troop subunits on the battlefield. Initially it will serve as a supplement to the Blowpipe and Javelin antiaircraft missile systems, and later on, in the 1990s, it will replace them. The high speed at which it flies to the target reduces the possibilities an airplane has for performing an antimissile maneuver. The Starstreak missile, which is beam-riding in the final phase of the flight trajectory, is equipped with three subcharges. Each subcharge contains a small high explosive charge that increases the kinetic energy of the arrow-shaped destructive element.

ПЕРЕНОСНЫЕ ЗЕНИТНО-РАКЕТНЫЕ КОМПЛЕКСЫ АРМИЙ КАПИТАЛИСТИЧЕСКИХ ГОСУДАРСТВ

Тип комплекса, страна-изготовитель (1)	(2) Характеристики ЗРК: год принятия на вооружение (3)	дальность перехвата, м макс / мин (4)	высота перехвата, м макс / мин (5)	время реакции, с (6)	максимальная скорость поражаемых целей, м/с (7)	зона обстрела (8)	стартовая масса, кг (9)	длина, м (10)	диаметр корпуса, м (11)	максимальная скорость, м/с (12)	тип взрывателя (13)	боевая часть: тип / масса (кг) (14)	система наведения (15)
«Редай», США (16)	1965	4100 / 600	2800 / 30	10	250	задняя полусфера (17)	8,2	1,12	0,07	550	контактный (18)	19) осколочно-фугасная 0,5	пассивная ИК (20)
«Блоупайп», Великобритания (21)	1972	4000 / 600	2000 / 10	4—6	220	круговая (22)	11,2	1,35	0,076	460	контактный и радио (23)	19) осколочно-фугасная 2	радиокомандная ручная (20)
«Стингер», США (25)	1978	5500 / 500	3500 / 30	10	340	»	10,0	1,38	0,07	700	контактный (18)	19) осколочно-фугасная 1,0	пассивная ИК (20)
«POST-Стингер», США (26)	1986	5500 / 500	3500 / 30	10	340	»	10,0	1,38	0,07	700	»	19) осколочно-фугасная 1,0	пассивная ИК + УФ (27)
«Джавелин», Великобритания (28)	1985	5500 / 500	2500 / 10	4—6	250	»	12,4	1,54	0,076	500	контактный и радио (23)	кумулятивная (29)	(30) радиокомандная полуавтоматическая
RBS-70, Швеция (31)	1978	5000 / 500	3000 / 15	5—7	300	»	13,1	1,32	0,106	540	контактный и лазерный (32)	19) осколочно-фугасная 4,0	по лазерному лучу (33)
«Мистраль», Франция (34)	1987	6000 / 500	3000 / 30	5	440	»	17,0	1,81	0,09	800	»	19) осколочно-фугасная 3,0	пассивная ИК (20)

Portable Antiaircraft Missile Systems of Capitalist Armies

Key:
1. Type system, manufacturing country
2. Characteristics of antiaircraft missile
3. Year of adoption
4. Intercept range, m (max/min)
5. Intercept altitude, m (max/min)
6. Reaction time, sec
7. Maximum target speed, m/sec
8. Engagement zone
9. Launch weight, kg
10. Length, m
11. Body diameter, m
12. Maximum speed, m/sec
13. Type fuze
14. Warhead (type/weight (kg))
15. Guidance system
16. Redeye, USA
17. Rear hemisphere
18. Proximity
19. High explosive
20. Passive infrared
21. Blowpipe, Great Britain
22. Circular
23. Proximity and radio-activated
24. Manual radio command
25. Stinger, USA
26. POST-Stinger, USA
27. Passive infrared plus ultraviolet
28. Javelin, Great Britain
29. Hollow charge
30. Semiautomatic radio command
31. RBS-70, Sweden
32. Proximity and laser- activated
33. Laser beam-riding
34. Mistral, France

The USA has completed development of and field firing tests on the new Saber antiaircraft missile. It is designed to intercept all types of subsonic airborne targets. Its principal merit, the designers believe, is the use of a beam-riding guidance system, which is highly resistant to interference. The system outfit consists of the missile, a transporting and launching canister and a reusable guidance system. The warhead can destroy both conventional and armored targets. The latter are detected and tracked visually.

The existing portable antiaircraft missile systems possess a number of identifying characteristics which reduce the effectiveness of their use. These characteristics include the infrared radiation produced by the nozzle and the smoke trail of the missile's sustainer, and emissions of the laser beam-riding guidance system, the transmitter of the radio command guidance line and the IFF system. In this connection, it is noted in the foreign press, finding ways to eliminate or weaken factors that expose its combat use is believed to be an important direction in the efforts to improve portable antiaircraft missiles.

11004

Support to Amateur Light Aviation Urged

91440063n Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 87 (Signed to press 31 Jul 87) pp 40-41

[Article by Ye. Pavlov: "The Big Problems of 'Small Aviation'"; first three paragraphs are AVIATSIYA I KOSMONAVTIKA introduction]

[Text] "We need to enlist all possibilities for clearing a broad avenue for the technical creativity of young people," noted CPSU Central Committee General Secretary Comrade M. S. Gorbachev in a speech during a meeting with veterans of the Stakhanov movement and with production leaders and innovators at the CPSU Central Committee. "And not only must we clear the way, we must also create all of the necessary conditions so that the creative potential of young people could be directed at solving the problems associated with accelerating the society's socioeconomic development." The CPSU Central Committee, USSR Council of Ministers, AUCCTU and Komsomol Central Committee decree "On Measures for Further Development of Independent Technical Creativity" imparted new momentum to the development of the scientific-technical creativity of young people.

We cannot yet say that the movement of amateur aviators is a mass movement. But more and more enthusiasts are joining the effort to build and design ultralight aircraft—airplanes and motorized sailplanes weighing not more than 150 kg. They are simpler, cheaper, and doubtlessly much more effective in a number of situations than traditional aircraft. The successes in this area are obvious. But at the same time the country still lacks an authoritative and empowered organization that could coordinate the activities of amateur aviators and provide them the help they need. The "amateur season" is presently in its peak. In what direction will this movement develop? Who will produce the ultralight sports aircraft? Will our sportsmen take part in the second world ultralight aircraft championship? Unfortunately the first proceeded without them.

These and other problems of "small aviation" are discussed at the editor's request by Ye. Pavlov, an associate of the USSR DOSAAF's journal KRYLYA RODINY.

At one time all aviation was "light" aviation, sports aviation. Every flight broke some record. This period, which lasted from the end of the first to the beginning of the second decade of our century, is described as the "heroic stage of aviation." Created in 1906, on 12 November of that year the aviation sports federation (the IAF [International Aeronautical Federation]) recorded the first world accomplishment: Alberto Santos-Dumont flew an airplane 220 meters. It took Henri Farman almost a year to surpass this accomplishment by a factor of over three. He flew 771 meters. For comparison, consider that according to IAF rules, breaking of the speed record would require flying faster than 110 km/hr, and the difference in speeds must be not less than 3 percent.

On 27 August 1913 the Russian pilot P. Nesterov performed his famous loop. Although it belonged to the Russian army, the airplane he flew (the "Nyupor IV" [transliteration], built in Russia by license) did not have any specific military application, and it was the essentially the first aerobatic sports airplane.

Symbolically this event occurred above Svyatoshino Airport near Kiev. DOSAAF's "Chayka" sports and training base is located not far from this spot today. It was here that a Soviet team won the P. Nesterov cup—that most honored prize of the IAF—during the eighth world championships in higher aerobatics. But one thing at a time....

World War I interrupted the "heroic stage" of amateur aviation. Pilots became machinegunners, bombers and scouts. But both during the war and after it, sports aviation did not disappear into the background of heavy bombers, air cruisers, fighters and attack aircraft.

The famous U-2—the "duck," the "corn bin" or the "bookcase"—was the favored and most popular airplane of that time. Designed by N. Polikarpov and tested by M. Gromov, this small and ultimately simple airplane equipped with a dependable Russian-made engine designed by A. Shvetsov dominated an entire era of Soviet aviation. A total of tens of thousands of different versions of the U-2 were built. Put on the conveyer in 1928, it was not removed from production until 1953. To be totally accurate its construction did not require a

conveyer. Owing to some successful design concepts the U-2 could be built under the most primitive conditions, in small shops. Pine, birch plywood and low-grade steel were all available and inexpensive, and made repairs simple.

The U-2 became the first aircraft for tens of thousands of pilots who perfected their flying in Osoaviakhim [Society for Assistance to the Defense, Aviation and Chemical Industry] aeroclubs and schools, and for pilots who in savage aerial battles dispelled the myth of the invincibility of the German Luftwaffe. The airplane was remarkably stable, sometimes it did not even react to the grossest errors of a student pilot, it could fly with the control stick released, climbing or smoothly losing altitude depending on the engine's operating conditions, and it recovered easily from a spin. Its landing speed was only 65 km/hr. Among foreign "contemporaries" of our U-2, mention should be made first of all of the English De Havilland-60, the "Moth." It is said that the advent of this biplane (which was externally similar to the U-2, by the way) initiated the wide interest in aviation abroad, leading to the organization of a large number of aeroclubs, first in England and then in other countries. Different modifications of this airplane retained the same name. They are simple to manufacture, and they operate dependably. "Moths" are still taking off today. And one of our U-2's is flying in France today. It was built by veterans of the "Normandy-Neman" regiment. We probably shouldn't have been in such a hurry to scrap the legendary airplane in the 1950s; you won't find drawings for it today....

The 1930s were the dawn of Soviet "small aviation." Around 200 design offices were operating in the country. Light motor-driven airplanes and gliders were built by aircraft designers A. Yakovlev, O. Antonov, S. Korolev, V. Pyshnov, A. Mikoyan, V. Ilyushin, R. Bartini, V. Shavrov, A. Moskalev, V. Gribovskiy, I. Tolstykh, A. Rafaelyants and P. Tsybin. Many of them never earned high titles and degrees, but their contribution to creation of everything "supersonic, stratospheric, jet, vertical take-off, cosmic and missile-carrying" that is in existence today was truly golden. The skies of the 1930s were filled with "ducks" and "tandems," conventional "tailless" aircraft and ones with short wings, "extensible wings" and gliders with sealed cockpits, and airplanes then deemed pterodactyls with three-wheel undercarriages and caterpillar and bicycle undercarriages; even a guided "cruise missile" was tested.

All of this experimental work was led chiefly by the Osoaviakhim. Competitions were announced, prizes were awarded, and flights, contests and races were organized. Pilots, designers, researchers and test pilots were trained.

During the postwar years experimental aircraft construction was concentrated in eight special design offices, while helicopter construction was carried on by two large design offices. Creation and development of new designs required unusually great manufacturing precision, and more-complicated and expensive equipment. Experimental aircraft construction became so laborious that it was within the means of only large creative collectives, employing many thousands of workers as a rule. It stands to reason that light and sports airplanes could also be built under the conditions afforded by concentrated experimental aircraft construction. Consequently we cannot but be saddened by the fact that we are not capitalizing on this possibility very much. After all, there is nothing that says that an aircraft made by a large company would have to be better. I think that what is important is not the sort of aircraft that amateurs would make, but what sort of designers such an aircraft would "make" of them.

It would be interesting to analyze how this work is organized abroad. Here is what the well known Soviet aircraft designer S. Yakovlev says in his book "Sportivnyye samolety" [Sports Airplanes]: "Abroad, light motor-driven aviation, and chiefly sports aviation, is represented by tens of thousands of small company-manufactured single- and two-engine airplanes, and by a large quantity of the most diverse amateur designs. Air races are conducted, and interest is being showed in building flying copies of historic airplanes. Annual production just by American companies alone exceeds 16,000.

"As a rule, foreign light airplanes are designed for multipurpose use. They are built for all tastes, needs and bank accounts. The family of light airplanes produced by the Cessna Aircraft Company, beginning with its one-engine piston-driven four-seat airplane and ending with its Cessna Citation jet, may be cited as an example. The most inexpensive two- and four-seat light one-engine airplanes are intended for amateur pilots. These aircraft are maximally simple in their piloting technique, and their maintenance is undemanding. The more-expensive four-seat aircraft are equipped with one or two engines of greater power, and they are better furnished. And finally, some expensive aircraft are intended to carry up to 15 passengers. As a rule they possess gas turbine engines and the entire assortment of the most sophisticated equipment. The popularity of light airplanes is being maintained to a significant extent by the opportunity provided for renting or leasing them, and by the extensive network of special technical maintenance centers and airports. There are over 11,000 officially registered airfields in the USA.

"The international Experimental Aviation Association (EAA) is functioning abroad. It provides assistance in amateur airplane building, in restoring historic airplanes and aviation equipment, and in improving proficiency. The EAA's membership consists of over 15,000 enthusiasts, from schoolchildren to astronauts, in 53 countries of the world. To those wishing to build an airplane with their own hands the association supplies finished designs or provides all the advice it can on developing original designs, and it helps its members select and purchase the

needed high-quality materials. And finally, the EAA takes the responsibility of registering and certifying amateur airplanes with the appropriate state organizations."

That is what is happening abroad. But what about in our country? Had I been asked a decade ago if our country supports amateur light aviation, I would have said quite categorically: "No! And it can't!" Our aviation industry is capable of providing student pilots and glorious champions with all of the necessary equipment—equipment which is not inferior in any way to Western models and which is even better than them. What is the situation today? According to far from complete data there are more than 2,000 units of light motor-driven homemade aviation equipment in the country in "personal" and "informal group" use. Three nationwide assemblies of the SLA [not further identified] were conducted in 1983-1985 in Koktebel (by Planerskoye Settlement in the Crimea) and in Kiev (at the "Chayka" base). Regional centers of scientific- technical creativity in aviation have been created in the Baltic region and in Kiev. The Ukrainian republic aviation scientific-technical creativity center is a subdivision of the Special Design Office imeni O. Antonov, and it possesses its own production base and design building. The incubation period of the spontaneous "amateur movement" is ending. It is time to get down to serious work.

It would take little to ensure a good beginning for Soviet light power- driven aviation. To train amateur pilots, it would be sufficient for example to reserve a relatively small training airspace, and an airfield measuring no larger than an ordinary stadium; but most importantly we would need industrially produced ultralight aircraft. Who would act as sponsor of "small aviation"?

This issue was discussed at a working conference of one group of the organizing committee for the SLA-87 nationwide assembly. It was given the job of drafting a document which would grant ultralight aviation the rights of citizenship. The people who convened were serious and true enthusiasts of the new effort, but they were unable to find a common language. The path to the truth is difficult. But the truth must be found, so that Soviet light power-driven aviation could be returned to its position of leadership. DOSAAF—a society called upon to assist aviation, the Ministry of Aviation Industry and other departments interested in maintaining a regular flow of trained aviators—should play a major role in this effort. It is time to solve the problem of amateur design and mass aviation sports, and to solve it on a wide scale, at the state level. Such is the will of the times.

11004

Kvant Astrophysical Module Described

91440063o Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 9, Sep 87 (Signed to press 31 Jul 87) pp 44-45

[Article by I. Pochkayev, candidate of technical sciences, V. Ulyanov and B. Naumov: "Observatory in Orbit"]

[Text] The Kvant astrophysical module structurally consists of a laboratory compartment and an access chamber made up of two cylindrical spaces of different diameters joined together by tapered adapters. The total sealed volume is 40 cubic meters, the length of the module is around 6 m, and the maximum diameter is equal to the station's diameter—4 m.

A bracing frame of regular octagonal shape (with a circumscribed diameter of 4 m) is mounted on the outside of the access chamber. This is called the scientific instrument compartment, and it is used as a mount for scientific apparatus working in open space. The access chamber terminates with the module's passive docking unit. Antennas of the Igla and Kurs radiotechnical systems, installed on the scientific instrument compartment, make it possible for the module to approach its transport module and supply ships.

The laboratory compartment, which has a tapered floor, is secured by way of a docking unit to the side of the station containing its service module. Equipment of the temperature and gas mixture control systems, a germoplata [translation unknown] and a ladder for outside work by the cosmonauts are located external to the tapered floor. The radiators of the temperature control system and pipelines for transferring propellant from Progress supply ships to the station's tanks are mounted on the cylindrical part of the laboratory compartment. Places for securing the module's solar batteries are located here as well. The batteries will be installed after they are delivered by a supply ship.

Instruments and machine units supporting the module's operation and providing life support to the crew are found within the laboratory compartment.

All apparatus is installed in an instrument zone separated from the inhabited zone by ornamental panels. To make the work of the crew easier, the floor, walls and ceiling are painted different colors, and each panel is numbered. Assemblies and units of the life support system and a light switch console are mounted on the side panels of the laboratory compartment's tapered floor.

The central post occupies a prominent place in the module. It is a rather large tilted instrument board in the tapered part of the laboratory compartment. Instruments, monitoring and control panels of the module's systems, a clock and communication resources used for contact with the orbiting complex and with the earth are

installed on this instrument board. A display and functional apparatus allowing the operator to engage in interactive exchange with the station's onboard computer complex are found on the left side of the central post. Apparatus in the scientific instrument compartment is controlled from the central post. There are two portholes on the floor of the laboratory compartment next to the central post. An optical viewfinder is mounted over the 40 cm porthole, and a visual star-tracking instrument is mounted over the 20 cm porthole. The star-tracking instrument is used together with an adjacent control to manually orient the entire complex by the stars.

New Elektron and Vozdukh [Air] systems are installed behind the panels on the right side of the laboratory compartment. The Elektron system, which operates on the basis of water electrolysis, produces up to 80 liters of oxygen per hour. The Vozdukh unit purifies the module's atmosphere and removes carbon dioxide and other toxic contaminants, dumping them overboard.

The air composition, pressure and the airtightness of joints and compartments are constantly monitored by various sensors and gas analyzers. The life support system of the Kvant module maintains the needed gas composition in the inhabited compartments of the module, and in the complex as a whole. The temperature control system sets the temperature conditions of the module's atmosphere. It is similar in design to the station's temperature control system, and it maintains a temperature from +18 to +28oC and the required humidity in the module.

Gyrodynes and six powered gyroscopes that can keep the space complex precisely oriented and maintain its stability over a long period of time are installed behind the laboratory compartment's ceiling panels. Such stability is very important to the work of the astrophysical apparatus, in times when an object in the sky must be kept within the field of vision of the telescopes for a long period of time. The most important advantage of the gyrodynes is that they are powered by solar batteries, which means a significant savings of the station's fuel. The gyrodynes and the station's correcting engines make up a single complex of actuating organs of the motion control system; they are designed to work both independently and jointly.

A Svetlana automated electrophoretic device for bioengineering experiments is located at the end of the laboratory compartment, behind a swiveling cabinet. It is used to obtain experimental lots of ultrapure antiviral drugs and fractions of microorganisms.

The small third and fourth portholes are in the access chamber, and they are intended for visual observations.

Machine units of the life support system, units of the complex's onboard control system, fans of the temperature control system, the control console of the Glazar apparatus and its floor-mounted airlock are installed on the left and right sides of the access chamber. The airlock is used to reload the photographic recording cassettes. The Glazar ultraviolet telescope itself, which was built at the Byurakan Astrophysical Observatory by Soviet scientists with the participation of Swiss specialists, is mounted on the scientific instrument compartment. Ultraviolet surveys made with the Glazar complex will make it possible to compile a star catalogue containing images of previously unstudied objects, and to update data obtained in experiments on sources of ultraviolet radiation.

Besides the antennas of the Igla and Kurs docking systems, the scientific instrument compartment contains the sensors of the motion control system and the telemetric and command radio communication antennas. An external television camera unit mounted on the passive docking unit transmits images of ships approaching the orbital complex to the cosmonauts and the flight control center.

The Rentgen complex consists of a Pulsar Kh-1 hard roentgen radiation spectrometric telescope, a Fosvich high energy spectrometer, a telescope with a shadow mask, and a Siren-2 gas spectrometer.

The Pulsar Kh-1, which was created by specialists of the Institute of Space Research of the USSR Academy of Sciences, makes it possible to analyze the radiation spectra of the centers of active galaxies and quasars, and a number of major galactic sources of hard roentgen radiation. The Fosvich high energy spectrometer was developed in the Planck Society's Extra-Atmospheric Physics Institute and Tubingen University in the FRG. The shadow mask telescope (the TTM) can be used to reconstruct an image in the roentgen range and to locate roentgen sources with a precision of several angular minutes. It was created by specialists of the Utrecht Space Research Laboratory in The Netherlands and Birmingham University in Great Britain. The Siren-2 gas spectrometer was developed by the space astrophysics department of the European Space Agency. The spectral resolution of this instrument makes it possible to analyze the chemical and ionization composition of hot gas in accumulations of galaxies.

Use of the international Rentgen observatory as part of the Kvant astrophysical module will make it possible for an international group of scientists to study the peaceful uses of outer space in one of the most important directions of fundamental science.

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Essays Explore Past, Future of Space Exploration

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[Articles by I. Minyuk and Doctor of Technical Sciences G. Vetrov: "Fantasy and Reality"]

[Text] From the First Satellite..., by I. Minyuk

Thinking back to the years when we worked on the first artificial earth satellite, the sensation I invariably recall is one of free creativity— the atmosphere which was created in the design office collective by Sergey Pavlovich Korolev. There were no well-trodden roads yet in rocket technology, while space technology was still a fantasy. And each of us knew that we were working on the most daring assignments of the century. This predetermined the success of the effort to a great extent.

I recall the hot debates over the appearance of the satellite. We designers were for a conical form, since it fit so well and naturally into the shape of the rocket. But weightier scientific considerations argued in favor of a sphere. And when everything seemed to be falling in place, the chief designer convened a special conference, the participants of which were selected in a somewhat random way from my point of view.

It must be said that by that time the first satellite was in the construction stage, and that many units, including those by which it is separated from its launch vehicle, had been tested out. Sergey Pavlovich surprised us with the question of increasing the size of the satellite to at least one meter in diameter. Providing subtle leadership to the conference, he persistently fought for his goal, while at the same time refraining from predetermining the conclusion that would be reached.

The main opponent was the assistant chief designer, S. Okhapkin, who was in turmoil over this proposal—the launch date would not be changed. Korolev patiently drew information out of him on the amount of design work that would have to be done and on the amount of time it might take to redesign the rocket. He interrogated one of the designers with special intensity on the possibility of using the satellite's separation units. The latter displayed all of his "diplomatic" capabilities between Okhapkin's threatening stares and Korolev's warm but willful stares: While he rejected nothing, he did not give support to anything either.

Forty minutes later we filed out of the room with our apportioned tasks. What Sergey Pavlovich learned during the conference apparently satisfied him, and he did not raise this issue again.

It is with emotion that I recall the time when the supervising designer, O. Ivanovskiy, sneaked us into the room of the assembly shop where the first satellite was being put together. Despite the simplicity of its design and of its appearance, there was a real sense of magic about it. We felt that we were on the threshold of something fundamentally new. And it was only after the first artificial earth satellite was launched that we realized that a new era was beginning in the life of mankind— the cosmic era.

...to an Orbiting Belt, by G. Vetrov

Those who were close to Sergey Pavlovich Korolev and who knew that it was his nature to constantly thirst for immediate and specific actions were surprised by the interest the chief designer expressed in his mature years to I. Yefremov's science fiction novel "Tumannost Andromedy" [The Andromeda Nebula], in which the writer offered a picture of ideal human society in the remote future. Nina Ivanovna Koroleva recalls that Sergey Pavlovich even wished to meet the author of the novel.

What was the cause of all of this interest? I think that Korolev discerned a relationship between predictions of the development of human society found in science fiction and the accomplishments in cosmonautics, which had a direct relationship to him. Moreover the year the novel was published was the same year that the first satellite was launched.

Korolev was no less impressed by the fact that the heroes of the novel had not forgotten about the first step into space even a thousand years later. In the vicinity of the equator, at the top of a white truncated pyramid, the author wrote, stood a sculpture of a man in work clothes of the Era of the Partitioned World. His right hand clutched a hammer, and his left raised a sparkling sphere with four transmitting antennas high in the pale equatorial sky. This was a monument to the creators of the first earth satellites who had accomplished a feat of labor, inventiveness and valor. The role which the writer gave to space researchers in the future structure of human society doubtlessly made a great impression on Korolev. The science fiction writer's imagination suggested to him the possibility of creating a Great Ring linking together worlds populated by reasoning beings. After surmounting enormous difficulties, the creators of the Great Ring created a society in which large numbers of people were able to pursue man's main work— scientific research.

A document that sheds light on Korolev's interest in I. Yefremov's novel was discovered quite recently. Sergey Pavlovich was impressed by the writer's ability to think boldly and on a grand scale. Concurrently a devout realist who was far removed from fruitless fantasy, he discerned a kernel of reason in the writer's idea of creating the Great Ring.

On 20 April 1962, while at the spaceport, S. Korolev drafted a report and sent it to the design office, where he continued his work on it after returning from his trip (the text contains corrections made with his own hand). This

Launch Date	Country	Satellite	Satellite Weight kg	Launch Vehicle	Orbit Parameters: Perigee, km	Apogee, km	Inclination, degrees	Period, min	Purpose
1	2	3	4	5	6	7	8	9	10
4 October 1957	USSR*	Sputnik-1 (PS-1)	83.6	Sputnik	228	947	65.1	96.3	To practically verify the possibility for creating an artificial earth satellite, to record some atmospheric parameters and to conduct radio communication
31 January 1958	USA*	Explorer-1	4.8	Juno-1	360	2,534	33.2	115	To obtain information on the earth's radiation belts
15 December 1964	Italy	San Marco-1**	113.0	Scout (USA)	198	845	37.8	94.9	To analyze the atmosphere and ionosphere in the equatorial zone
26 November 1965	France*	A-1 (Asterisque)	42.0	Diamant-A	526	1,809	34.2	108.6	To monitor the work of the launch vehicle's onboard apparatus
29 November 1967	Australia	Vresat**	48.5	Redstone (USA)	170	1,250	83.3	99.0	To study solar and cosmic radiation
29 January 1969	Canada	Isis-1**	240.0	Thor-Delta (USA)	575	3,514	88.5	128.0	To study the ionosphere
8 November 1969	FRG	Azure**	71.2	Scout (USA)	384	3,146	102.0	122.0	To study earth radiation and corpuscular solar radiation
11 February 1970	Japan*	Osumi	24.0	Lambda-4S	340	5,140	31.0	144.6	To monitor the work of onboard systems, to record some parameters of near-earth space
24 April 1970	China*	China-1	173.0	Long March-1	441	2,386	68.4	114.0	To monitor the work of onboard apparatus, to record some parameters of near-earth space
28 October 1971	Great Britain*	Prospero	66.0	Black Arrow	537	1,593	82.0	109.0	To test solar cells, heat-reflecting paints and hybrid electronic circuits. To record meteor particles
10 August 1974	Netherlands	ANS-1**	130.0	Scout (USA)	274	810	98.0	95.2	To study ultraviolet and roentgen radiation from astronomical objects
15 November 1974	Spain	Intasat**	24.5	Thor-Delta (USA)	1,455	1,460	101.7	115.0	To probe the ionosphere and test semiconductors
24 October 1978	Czechoslovakia	Magion** (launched together with the satellite Interkosmos-18)	15.0	Kosmos (USSR)	407	768	83.0	96.4	To study the three-dimensional structure of low frequency electromagnetic fields in near-earth space
18 July 1980	India*	Rokhini-1	35.0	SLV-3	300	900	44.7	96.8	To monitor launch vehicle's onboard systems
22 February 1986	Sweden	Viking**	536.0	Arienne-1 (EKA)	800	15,000	98.6	240.0	To study the magnetosphere and auroras

Note: *--country possessing its own satellites and launch vehicles. **--launched by launch vehicles of other countries.
Other satellites that were built and launched commercially include Palapa (Indonesia), Arabsat (Arab countries), Morelos (Mexico) and Brazilsat (Brazil).

First Artificial Earth Satellites

document is titled "Report on Developing Human-Controlled Satellite Ships and Training the Necessary Specialists for Space Flights."

A debate on the duration of manned space flights was the immediate basis for the report. Yu. Gagarin and G. Titov had just completed their flights, and the program of future work had to be mapped out. Working on it, Korolev attempted to portray the future development of cosmonautics over a period of many years: "It would be totally unjustified to bring down, and consequently completely or partially destroy satellites after they complete only a certain amount of work, or after a satellite's apparatus ceases to work, after film, gas reserves and power supplies are exhausted, and so on.

"Installing, for example, outfits of spare apparatus or complex, heavy propulsion units with the purpose of lengthening performance time by, let us say, one unit of measurement would not solve anything. In a number of cases this would be simply impossible to do, and unprofitable.

"There is but one sensible and reliable solution to the problems stated above: We need to develop and put in place a certain system consisting of the needed number of different satellites flying permanent orbits about the earth in the form of an 'Orbiting Belt,' at altitudes from about 300 km to 2,000 km in the beginning.

"The satellites of the 'Orbiting Belt' should include several orbiting stations (two or three at first) manned by a cosmonaut crew.

"The 'Orbiting Belt' system must be designed for prolonged operation in space—for example 10-15 years.

"The 'Orbiting Belt' system should be serviced from earth by human- controlled satellite ships and by orbiting stations.

"This solution can be made possible through the wide use of the method of docking spacecraft.

"The 'System' of one-time flights into space presently in use does not produce significant results and will lead to enormous unjustified losses."

Note that the Orbiting Belt in Korolev's report is similar to the Great Ring—sort of a simplified model of it tailored to the present level of technology. This provides further substance to the suggestion that a direct relationship existed between Korolev's real plans and fantastic ideas about the remote future. At the same time, as I. Yefremov admits in the foreword to his novel, he was so impressed by the launching of the first satellites that he brought the time of the events described in the novel a millennium closer.

The idea of an Orbiting Belt is not encountered again in any known document prepared by S. P. Korolev. This may be explained by the fact that the report discussed tasks which in their full volume were felt to be premature by Korolev. But he did begin tying his current work in with this futuristic development. Hence his desire to increase the duration of flights and to begin practicing the docking of spacecraft as quickly as possible, using refitted Vostok spacecraft for this purpose.

The fantastic idea of creating a Great Ring, one which would join together reasoning civilizations and make human life unending, recently gained unexpected support. At the eve of the 27th CPSU Congress two prominent publicists—Ernst Genri and Vitaliy Kobysh—published their "Dialogue in Behalf of Generations" in the newspaper SOVETSKAYA ROSSIYA. Discussing human happiness and stating their main idea—that only communism can provide real happiness, Genri recalls certain components of happiness which I. Yefremov laid at the basis of his science fiction novel: the pre-eminence of beauty and insatiable curiosity about space.

The most noteworthy thing in Korolev's long-range plans was his accurate prediction of the paths of further development of cosmonautics. And mainly his conviction that "cosmic curiosity" would be one of the most important features of civilization's further development.

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List of Articles Not Translated from AVIATSIYA I KOSMONAVTIKA No 9, Sep 87

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